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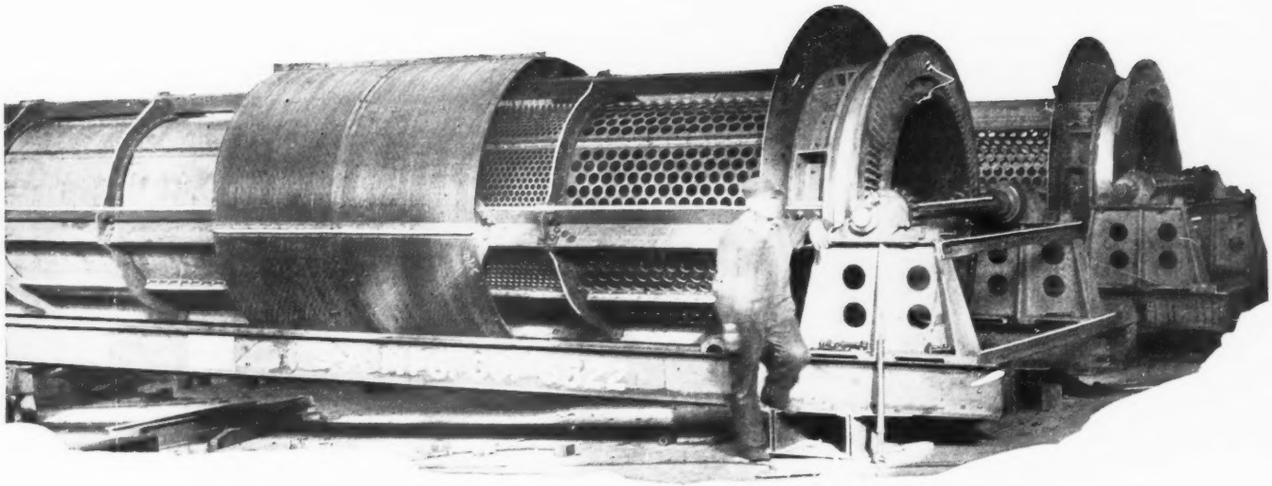

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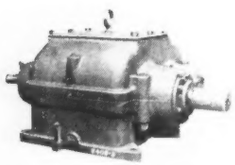

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Volume 124 **New York, August 27, 1927** *Number* 9

ENGINEERING AND MINING JOURNAL

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A. H. HUBBELL A. B. PARSONS

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Assistant Editors
W. N. P. REED H. D. KEISER

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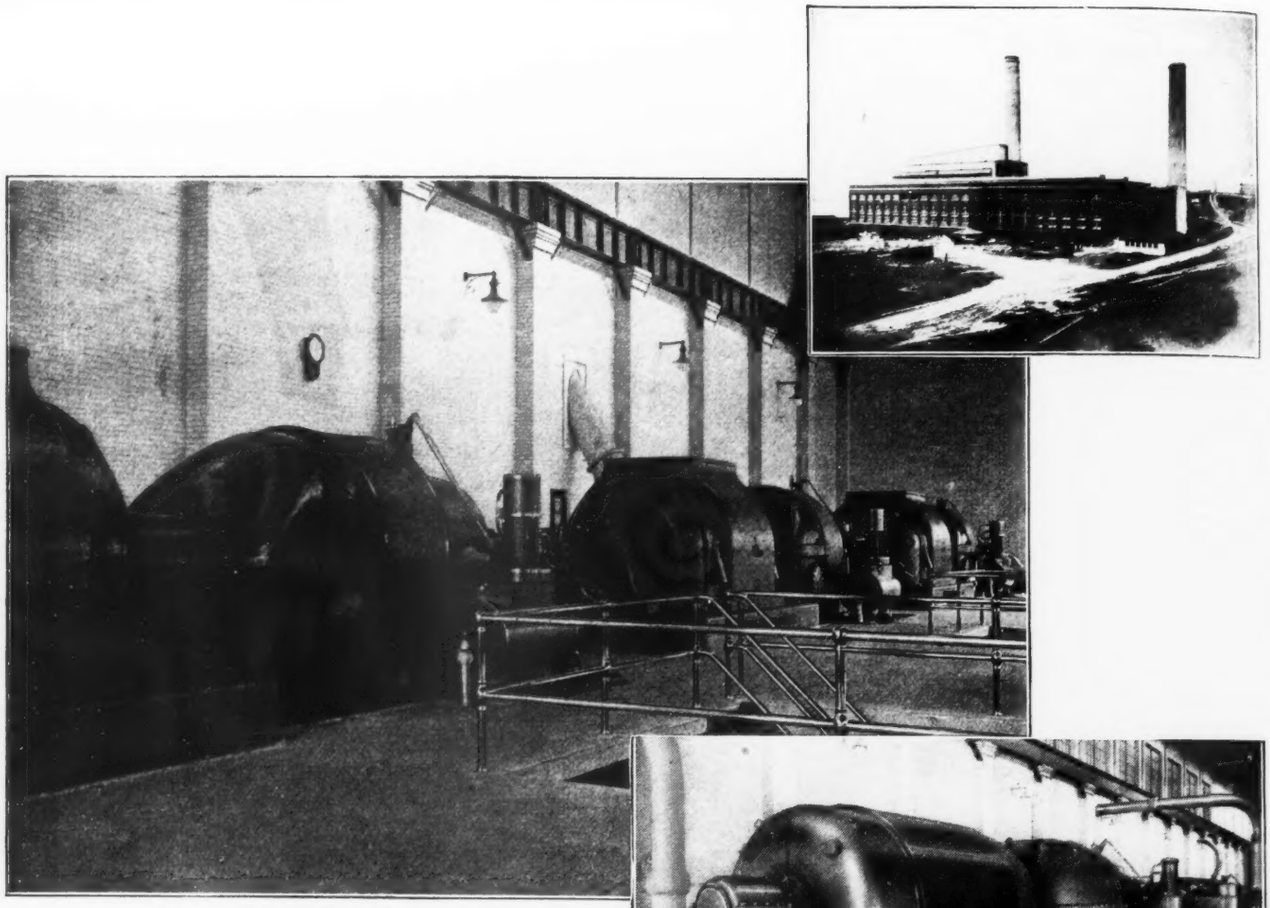

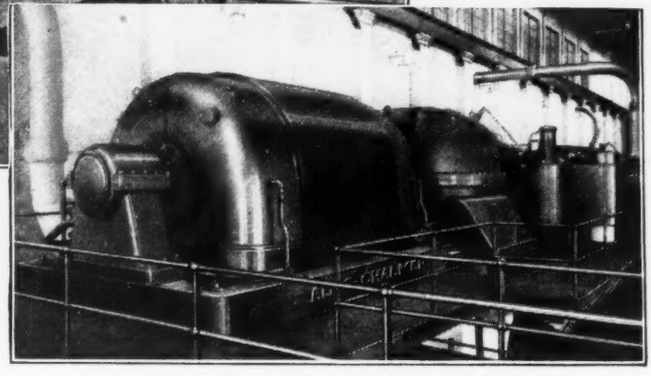

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50,000 kw. in Allis-Chalmers Steam Turbine and Alternator Units are now installed in the station illustrated above.

In 1914 three 5,000 kw. units were installed, in 1919 a 10,000 kw. unit was added, while in 1922 another 10,000 kw. unit was placed in service.

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The Bureau of Mines Campaign

SEVERAL AGENCIES within the mining industry, notably the A.I.M.E., are calling attention to the restrictions placed upon the activities of the U. S. Bureau of Mines through inadequate appropriations from the federal government. The situation merits the serious consideration of the entire industry. Apparently the Bureau is doing its utmost to help itself—it has announced that as a result of insufficient appropriations a decreasing amount of research work is being done at the experimental stations, and that, for the same reason, it is impossible for it to attempt major research problems. The forthcoming report of the Bureau, covering the year ended June 30, should provide much useful material for the campaign for a materially increased appropriation. This report will analyze the expenditures of the year and present them in a form similar to that used by a private company in reporting to its stockholders, in this instance the stockholders being the general public and dividends the benefits accruing to the public from the Bureau's work. The plan is to be commended and should afford valuable information of which the general public and the mining industry has been unaware. It should aid in building up within the nation a greater appreciation of the Bureau's accomplishments and importance.

A direct measure of the net gain to the general public resulting from the work that has been done by the Bureau, however, is difficult. How, for example, can the increase in federal industrial profit taxes, resulting from the Bureau's assistance to the mining industry, be determined? Can the beneficial influence of the Bureau's work at many educational institutions, and the aid rendered technical education in general, be expressed in terms of dollars? Can the number of lives saved within and without the industry by workers and members of many organizations trained in first aid by members of the Bureau be ascertained, and a cash value placed on this work? Obviously the extent and importance of such service can neither be determined nor evaluated. Nevertheless, much of the work done by the Bureau is of this nature—work of the utmost importance to the industry and to the country.

Little assistance, if any, can be expected from the general public in the campaign, since it is almost entirely unaware of the source of the benefits it has received from the Bureau's work. The mining industry, on the other hand, collectively, is aware of these benefits to the industry and to the general public. It realizes that the industry has in the past received much from the Bureau's work and that there is much more that the Bureau could do for it now and in the future, if sufficient funds were appropriated. It knows that the nature of much of this work is such that it can best be performed by the Bureau rather than by private interests. Briefly, therefore, the campaign is the duty of the industry, and it behooves the industry to proclaim its interest in greater appropriations for the Bureau and to wage a strenuous campaign to this end, continuing through the next period of Congressional consideration of federal appropriations. There is room for the entire industry on the band wagon of increased appropriations for the Bureau—and bass horns should be the rule rather than piccolos.

Hoover and the Presidency

FOLLOWING President Coolidge's terse statement that he does not choose to be President for another term, other available candidates have received no little discussion in the press. In the front rank is Herbert Hoover, whom mining engineers still think of as belonging to their own fraternity, even though his work since the outbreak of the war has been of a social and political rather than of an engineering nature. Each of the possible candidates will no doubt be discussed at length during the coming year. *Scribner's,* in its September issue, is perhaps the first magazine of general circulation to give a biographical sketch of one of the leading candidates, since the President's announcement. It is significant that Hoover should have been selected as the subject.

That Hoover can do difficult jobs according to the best engineering standards, and with perhaps more than the usual engineer's regard for diplomacy and tact, is unquestioned. He took a Cabinet place that had little prestige and made of it one of the most important and respected government departments. Only recently he has done a work in the flood districts of the South that few have any conception of, and he has done it without any subsequent suggestions of graft or incompetence. Even the press that is antagonistic to the Administration had no qualms about the ability of Hoover to do this job, nor is it looking for any weak spots in the work that was done. Further, Hoover's work is not unappreciated; he is held in high esteem by the President, who places the greatest confidence in his abilities and judgment, and who would no doubt feel that the Presidential duties could safely devolve upon him.

Hoover's weakness lies in his lack of political training and in not having the politician's temperament, things in which Wilson was also weak, but in which Coolidge has been strong. He is a poor speaker and has not the personal magnetism that is supposed to command votes. And yet, Coolidge himself has rather a cold personality, and his immense popular vote in the last election was based on confidence rather than on personal popularity. On the basis of trust, and respect for his achievements, Hoover should certainly go equally far.

If Hoover chooses to be President, and what he has done in the past indicates that he has no particular aversion to the idea, his chief barrier will be the Republican convention of 1928. Politicians control the selection of a

nominee, and with these Hoover is none too popular. His few attempts to play the political game have not been so outstandingly successful as his social and business achievements.

What Is Cool Air?

AIR at 90 deg. F. dry bulb and 80 deg. F. wet bulb, deficient in oxygen and containing an excess of carbon dioxide, passing through a stope with a velocity of 20 ft. per minute would be called by the average miner "bad air." If this same air were circulating at a velocity of 150 ft. per minute, the stope would be regarded as a comparatively cool working place, because the cooling power of the air would be three times as great. Again, if the *wet-bulb* temperature of this air rose to 89 deg., even though the circulation velocity remained at 150 ft. per minute, conditions would be unbearable. The two important conditions governing the apparent "coolness" of air are its velocity and wet-bulb temperature.

Dr. Leonard Hill has done extremely valuable work in the study of the physiological effects on men of various underground climatic conditions, and one of his experiments is particularly instructive. A number of students were confined in a closed chamber until the oxygen content had fallen below 17 per cent and it was impossible to get matches to burn: the carbon dioxide content rose to between 3 and 4 per cent; the wet-bulb temperature was 83 deg. F. and the dry bulb slightly higher. Under these conditions the students suffered considerable discomfort. The pulse rate was high and their clothing moist with sweat. The fans inside the chamber were then started, with the result that a most marked effect was noticed immediately. Their average pulse rate fell from 97 to 79 and when the fans were stopped they begged to have them started again. During this experiment certain of the subjects were supplied with fresh air from outside through tubes and mouthpieces, but they obtained no appreciable relief.

This experiment brings out the fact that the quality of "freshness" is largely due to the motion of the air, and this is a point of great importance to the division foreman seeking to cool his stopes. He need not feel discouraged by the knowledge that the air has a temperature of 90 deg. F. dry bulb and is known to be deficient in oxygen. If he can secure its rapid passage through the stope, the cooling effect so obtained will give the impression of "fresh air." Rees has shown that the cooling power of air is proportional to the square root of its velocity.

Stope cooling is an important branch of the main subject of mine ventilation. The main ventilation system will, in most cases, have been designed by expert consultants to provide for the circulation of a sufficient volume of air through the mine to carry away the gaseous products of breathing and combustion and maintain both the oxygen content and cubic feet of air per man required by law. But there must, in nearly all cases, remain certain sections of the workings which must be sacrificed to the efficient working of the major ventilation system or, at best, will not receive their due share of the general benefits. Such a condition comes within the experience of every operator, and specific examples need not be cited. Such workings call for the consideration of secondary ventilation independent of the general scheme.

The invention of the katathermometer has provided a means for making observations of the cooling power of air currents, since the instrument reacts to the combined effect of the velocity and the wet-bulb temperature. It is to be hoped that in the not-far-distant future, more sampling and engineering departments will be equipped with the katathermometer, torsion anemometer, and hygrometer, and will have personnel trained in the manipulation of these instruments so that a foreman will be able to call for a wet kata cooling factor determination in one of his stopes just as he calls for samples and direction lines today. He will then have available data of great value in considering the question of secondary ventilation. Although each individual experiences a different cooling effect from the same air current by reason of, among other factors, the individual differences in amount of sweating, systematic kata observations would enable a management to establish a low limit of stope cooling condition. That is to say, that having a kata factor for each working place, statistics of tons per man, accidents, and other data would point to a limit of conditions beyond which it would pay either to close down the stope or provide secondary ventilation.

The Itinerant Mining Engineer

ENGINEERING, especially mining engineering, has one feature attractive to some, disagreeable to others—namely, the frequent necessity of changing one's abode and going to far-off places where living conditions are far different from those in the centers of civilization. Such changes may be made while continually in the employ of one company, but more often they involve an interim of job-hunting that tends to subdue one's self-esteem and flatten his pocketbook. A letter just received from a reader of the *E. & M. J.* says that after five months of forced vacation he has found it advisable to take a position as assayer in a far-off land where only single men are desired, thereby necessitating leaving his family at home in the States. "Another great pleasure in following this game," he says, satirically. "Well, that ought to give them a year's vacation, anyway, so let's hope it's all for the best. This is not for publication unless it be used as a persuasion against young high-school students entering the mining industry."

One may venture the opinion that the writer of this letter has had a little hard luck in finding a job this time. Certain it is that able mining engineers often have to accept unattractive appointments, but it is also true that the special experience and ability of some unsatisfied mining engineer is just what some employer is looking for, and thus, in turn, a desirable position becomes available.

Engineering is not for every one. Most engineers, to be successful, require a liberal amount of wanderlust in their spiritual make-up; they should not only be prepared but actually look forward to going to the outposts of civilization where many hardships unknown to the city dweller must be faced in the effort to harness the forces and overcome the obstacles of Nature and to extract treasure from her storehouse. The open-air life must be accepted as an improvement on the conveniences and pleasures of a more highly developed civilization. Hiatuses in current income must be accepted philosophically and provision made for them when possible.

Furthermore, it is necessary not only for the engineer to have these qualities but for his wife, if he be so for-

tunate as to have one, to be similarly endowed. Women, as a rule, perhaps, find the experiences of the itinerant mining engineer harder to accept than do men; but there are many, nevertheless, who enjoy them. Few are the mining camps, even in the most remote parts of the world, where there are not one or more intelligent, attractive, and happy women without whose sympathetic company the engineer would pass many hours discouraged at his lot.

The suggested warning to high-school students shall only go to those who have never felt any yearning to leave home; who prefer a good movie to a night spent in a tent; who feel uncomfortable in a flannel shirt. Those with the engineering spirit, who know what difficulties engineers must face and are prepared to meet them, will find the work more attractive to them than a less colorful though more permanent position in the big town or at home.

Beating the Sword Into the Plowshare

IN A RECENT ISSUE of *Echo des Mines et de Metallurgie*, the Lewis Gun Co. advertise their "Forax" jackhammers and "Liégeois" pneumatic picks. It is significant of the spirit of the world today that the armament firms of ten years ago are now devoting much of their time, plant, and technical skill to the production of the machinery and appliances of peaceful industry. Men who only a decade ago were facing each other in bristling animosity across the desolate wastes of Flanders are to be found today with their heads together over the conference table for the furtherance of some industrial scheme of mutual benefit. Old enmities and suspicions are fast being relegated to limbo, and although forging the machine gun into the jackhammer may not be so euphonious and apt an expression of an idea as the original words of the prophet Micah, it is no less pleasant and no less significant for that.

Judge Gary Passes On

AMERICAN industry lost one of its outstanding leaders in the death last week of Elbert H. Gary, chairman of the board and chief executive officer of the United States Steel Corporation. Though his training was in law rather than in engineering, nevertheless the activities of the corporation that he did so much to develop were mainly of a distinctly engineering nature, and his going will mean a personal loss to a great many members of the profession.

Gary's name will live not only because, for over a quarter of a century, he was the head of the greatest industrial organization that the world had seen, but also, and more important, because of the high ethical and moral standards by which he conducted its affairs. Not only when "Big Business" was most actively attacked but at all times he leaned over backward, it seemed to some, in his efforts to do the fair and just thing. He proved that a large corporation may be conducted in as honest and straightforward a manner as the business of the small individual. The success that he gained by following the highest ideals may well be the subject of profound study and thought by industrial and civil executives throughout the world.

Hollinger Shares Decline

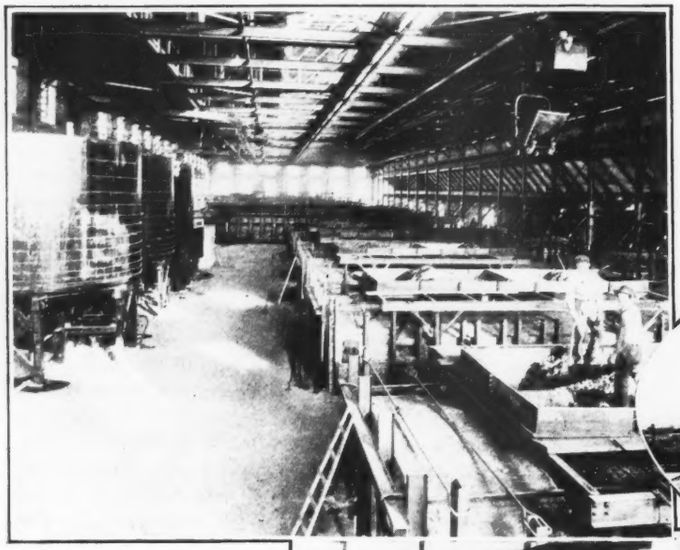
A SHRINKAGE of about $30,000,000 in the public appraisal of the value of the Hollinger Consolidated Gold Mines, Ltd., is indicated in the decline in the market price of the shares from a high of $22.75 some months ago, to a recent low of $16.50. Naturally there is widespread speculation as to the reasons for this sharp decline in the stock of the biggest and most profitable gold-mining enterprise in the western hemisphere and a close rival of the largest in the world. Officially, little is said; and this silence naturally is not reassuring to shareholders. Among the unofficial explanations of the break are: liquidation of the large holdings of the McMartin estate; pinching of the ore at depth; raking of the orebodies on the lower horizons into McIntyre ground; growing realization on the part of the management of the impracticability of the ambitious program of milling 8,000 tons of ore per day, or at least the necessity for greatly lowering the tenor of mill heads if that tonnage is reached; impending increase in mining costs arising from the failure to backfill the stopes as they were mined in years gone by; and heavy commitments being made in other properties in Canada that may not prove to be of value. Of this last point it may be said that it has two sides. New properties, if they are selected and developed with judgment and skill, may become valuable assets and may serve to perpetuate the parent company when the original mines become less profitable—for it is inevitable that they all do sooner or later.

Just how much psychological influence each of these various factors, real or imagined, may have had on the stock-dealing public, no one can say. At any rate, it is apparent that there have been in the last few months more willing sellers than anxious buyers. It does not seem likely that any physical change in a property as huge as the Hollinger could take place rapidly enough to alter the situation materially in a period of a few months. There are scores of veins and hundreds of stopes. The broad development of the lower horizons is far in advance of the detailed development that actually blocks out ore that can be included in the ore reserves. It does not seem reasonable to suppose that any radical change has developed in a brief interval. The company has virtually finished the expansion of its mill equipment to handle 8,000 tons of ore per day; and heretofore, in spite of many doubting Thomases, the tonnage has been increased according to the promises of the management. That, of course, does not prove that 8,000 will be reached, but it is indicative. That the grade of the heads will be maintained, when and if the tonnage is brought to the present objective, is doubtful. Perhaps the biggest question in Hollinger's future is how *great* will be the decline in heads when the maximum tonnage, whatever that may eventually prove to be, shall have been attained.

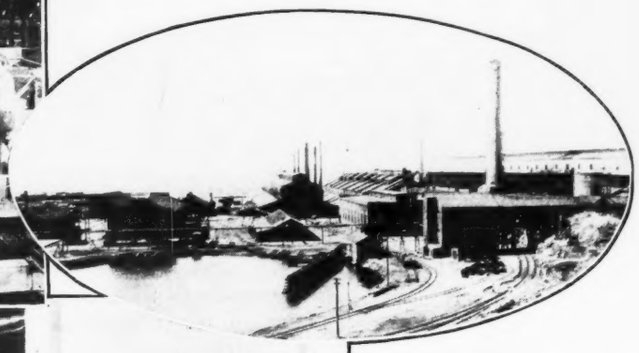
Aside from all this, however, there is one logical reason for a decline in Hollinger shares. They were inflated along with some other Canadian issues that might be mentioned, by a wave of speculative optimism. Giving the mine the benefit of the doubt in most of the uncertain points, it is improbable that a valuation of $125,000,000 ever has been justified.

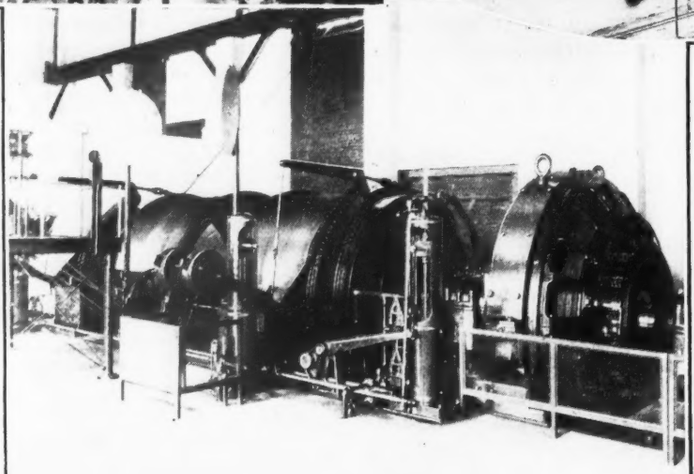
In the last week or so, speculative activities have brought new high levels to many Canadian mining issues, but Hollinger was hardly affected.

International Nickel's Canadian Plants



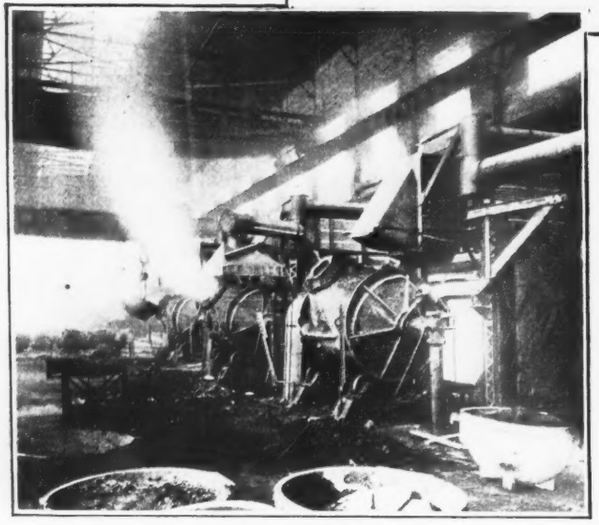
To the left is the interior of the calcination building at the Port Colborne refinery. Below are the ore bins, blast furnace, and converter buildings at the Copper Cliff smelter

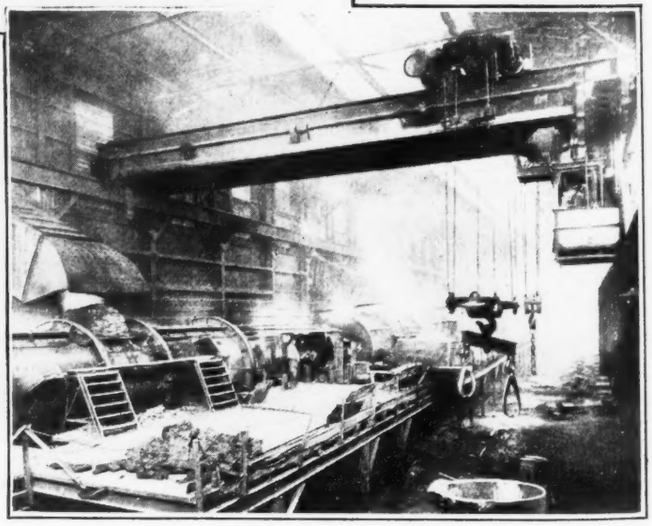


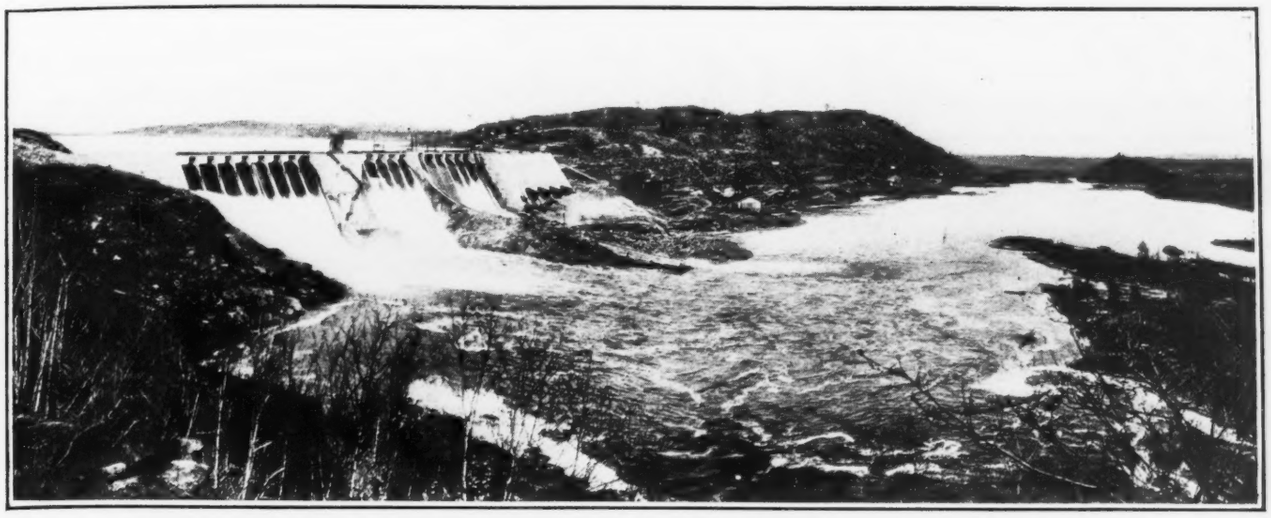


To the right is the skiphoist at Creighton mine. Drums are 12 ft. in diameter by 7½ ft. wide. Hoisting speed, 2,500 ft. per minute

The two photographs at the bottom of the page show converters in action at the refinery (on the left), and at the smelter







A part of the hydro-electric power development at Big Eddy, on the Spanish River

International Nickel

Latest Addition to Ranks of Hundred-Million-Dollar Mining Companies

By Edward Hodges Robie

HUNDRED-MILLION-DOLLAR mining corporations are few and far between, so that when a new one appears on the horizon the event is notable. Until recently America (and perhaps the world) could boast of only three. First, of course, is the Kennecott company, with its 4,500,000 shares, valued, at current prices on Aug. 20, at $309,000,000. Utah Copper, its most valuable subsidiary, is, in itself, in the hundred-million-dollar class. Next to Kennecott comes the American Smelting & Refining Co., whose common and preferred shares together are valued at $165,000,000. Third is the Anaconda company, which can now be put at $138,000,000; this includes, of course, a majority holding of Chile Copper, in itself a corporation whose share value is $160,000,000 and which should, perhaps, therefore be given third place in its own right. However, for the present purpose, Anaconda-Chile, which is under one management, may be combined.

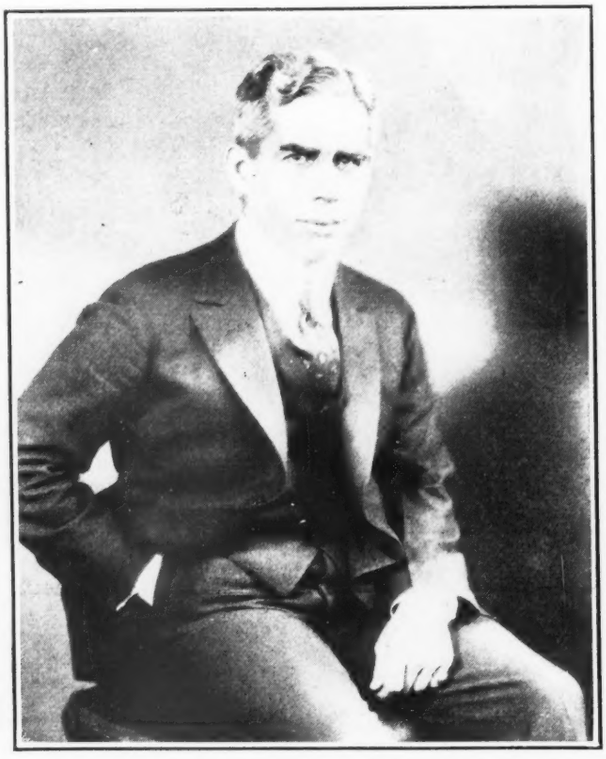
The newcomer in this exclusive group—not the "Four Hundred" but the "Big Four"—is International Nickel, valued at $121,000,000. Only a month or so ago its stock-market valuation reached the enormous total of $133,000,000, the common stock (1,673,384 shares at $25 par) selling at $73.50 a share.

Six years ago I was asked to suggest a good mining stock for investment, and International Nickel was named. It was then selling for around $14, and I felt that in time it should approach its pre-war value of about $30. Though dealt in on the New York Stock Exchange, it was in the list of inactive issues, and many newspapers omitted it entirely from their quotation lists. Three years later, in 1924, I was chided for my advice, for in that year International Nickel sold as low as $11.50 a share. In three years since then it has attained a value more than six times what it was. What has happened?

Two chief reasons may be given for this spectacular advance. In the first place, the company was thought to have discovered a new copper orebody of great possibilities which would assure a large increase in profits as soon as it could be opened up. Not a great deal was known about this new ore deposit, but imagination was allowed full play. Second, the good news came at a time when the stock market was booming, especially the Canadian mining stock market, and any shares that possessed even rather slight possibilities of speculative gain were bought to the hilt. It is possible that pool buying of International Nickel shares figured in the spectacular advance. A further reason for the strength of the stock was the established reputation of the company for progressive management and success in seeking wider outlets for nickel, its principal product.

Before discussing the present status of the company, let me present a brief historical summary. Nickel was discovered in the Sudbury district of Ontario about forty years ago. For many years thereafter the industry was a struggling one, as there was not much use for the product. In 1902 a consolidation of several nickel-producing companies was made, to which was given the name Inter-

national Nickel Co. Progress thereafter was more rapid. The Sudbury deposits proved, on development, to be much richer and more extensive than any others in the world, and in the course of time made the New Caledonian deposits, theretofore the chief source of supply, of insignificant importance. Increased use for the product was afforded by the development of nickel steel, chiefly used for armor plate in the race for military supremacy that preceded the World War. The International Nickel Co. became prosperous, as did its only competitor in the Sudbury district, the smaller British-owned Mond Nickel Co. The war brought much greater prosperity, for the amount of nickel required—chiefly for munitions—doubled within a year or two. Then came the aftermath. No more nickel was required for military purposes, and other uses had not been developed to any great extent. Nickel, at even around 30c. a pound, was too dear a metal for a bankrupt world to buy. The entire works were shut down for several months while accumulated stocks of metal were slowly marketed. Gradually the demand reasserted itself as the result of much technical and commercial research. Costs were cut to the bone; mining, smelting, and refining methods and equipment were improved; a new rolling mill was built; and the uses of nickel, and its natural alloy with copper, Monel metal, vastly widened. No longer could the industry be dependent on the demand for nickel for munitions. Now, International Nickel produces somewhat more than it did before the war, but not nearly so much as at the height of war-time demand. The market is still definitely limited, and as the company produces perhaps two-thirds of all the nickel used in the world, its production can be expanded but slowly. With recent earnings of about $3 per year on the common shares, and dividends of $2, there would seem, in view of what has been said so far in this paragraph, nothing to get unduly excited about.



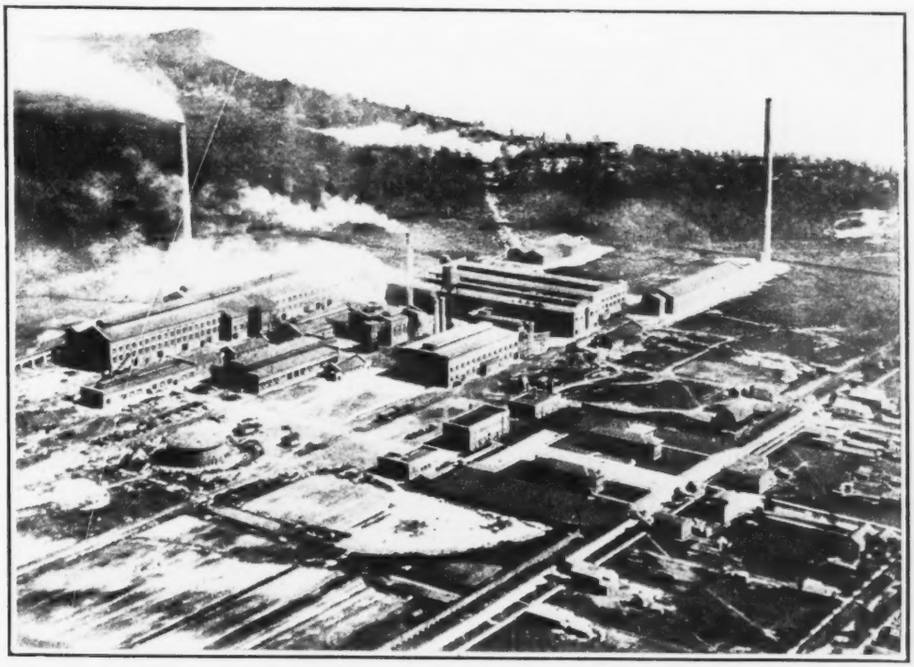
R. C. STANLEY
President of the International Nickel Co.

By far the largest proportion of the company's ore so far has come from the Creighton mine. This is a phenomenal deposit, for it has yielded to date approximately 12,000,000 tons of ore running around 1½ per cent copper and 4 per cent nickel—what might be called a $30 to $35 ore. It is thus easily one of the great mines of the world. The deposit is lenticular, with a maximum length of about 1,000 ft., a width that varies but averages perhaps 100 ft., and a dip of about 45 deg. The ground becomes more broken at a depth of about 2,000 ft., and it was feared for a time that in a very few years the ore would be exhausted, but new stringers and, in fact, an entirely new lens, have been found, so the life of the mine continues indeterminate.

The very richness of the Creighton ore has, however, set a limit to the scale of profitable operation. The nickel and copper are closely associated, and to produce a unit of copper, with its unlimited market, two or three units of nickel must be turned out, outlets for which have to be found. Even though the price of nickel were 20c., instead of 30 or 35, consumption would in all probability still be definitely limited. So, if the Creighton mine were several times as large as it is, or has been, the company would not be very much better off so far as past or present conditions are concerned. Ten or fifteen years ago, when the prospects for Creighton's future were viewed none too favorably, another promising deposit was developed, the Frood or No. 3 mine. The diamond drill and a moderate amount of stoping showed it to be an enormous deposit—perhaps 100,000,000 tons—but of much lower grade than Creighton, roughly 1½ per cent each of nickel and copper near the surface, though somewhat better at depth. It was worked for a time at the height of the war demand, but since has lain idle. Two or three years ago at a time when prospects looked none too good at Creighton, plans were made to reopen it and to concentrate the ore by flotation. Further diamond drilling was conducted, and this is where the story begins to be interesting. At depths below 2,000 ft. the character of the ore changed; the nickel content continued pretty much as in the upper levels, but the chalcopyrite mineral was much more plentiful, so that a large deposit of ore was indicated that would contain more copper than nickel. This, of course, changed the situation entirely. Heretofore, if the company produced, say, 25,000 tons of nickel a year—all it could sell—it would also be able to produce not more than about 11,000 tons of copper. With an ore containing twice as much copper as nickel, however, in producing 25,000 tons of nickel, 50,000 tons of copper could be turned out annually, a tonnage that, if achieved, would compare favorably with other large copper companies. In fact, International Nickel may take its place along with the Chilean and African companies as a copper "menace" if, as, and when the promise of a few drill holes materializes. Those familiar with ore deposits in this district believe the chances are good for a big copper mine of comparatively high grade, but it is too early yet to say, for there has not been sufficient development. No official announcement has been made as to whether there is 10, 50, or 100 million tons of this high-grade ore; it is altogether probable that the company

itself has only a remote idea, though the minimum tonnage that has been proved is sufficient upon which to build ambitious plans for the future.

The old shaft, which was sunk in ore, had to be abandoned. A new round shaft was given much consideration, but it was finally decided to sink a rectangular shaft, like the shafts at the company's other properties. The dimensions are approximately 16 x 30 ft., with one cage and two skip compartments. It is being sunk vertically in the footwall at the rate of 200 ft. a month, and is now down about 1,500 ft. It is planned to bottom it at 3,000 ft.



A birds-eye view of the Port Colborne refinery, on the Welland Canal, where all of the company's metallic nickel is now produced.

The new ore required thought on the part of the metallurgists also. It has been decided to reserve the Creighton deposit as the ore supply for the manufacture of Monel metal, the relative proportions of nickel and copper in that mine being substantially correct for that purpose. Requirements of metallic nickel would be supplied from the newly developed Frood deposit. This ore promises to be of sufficiently high grade to make the previous plans for concentration inadvisable. This is particularly true in view of the fact that it has so far not been found possible, by any method of selective flotation, to make a reasonably clean separation of the nickel and copper. It is cheaper to smelt the chalcopyrite and nickeliferous pyrrhotite together and make the separation in the refining operation.

It is likely, therefore, that the ore will merely be ground, roasted, and charged to reverberatory furnaces. For many years only one reverberatory has been used, but additional units will be built. They will be more economical than the blast furnaces, in which the largest proportion of the ore has heretofore been smelted at this plant. Plenty of power is available from the company's

Coarse ore travels along these 36-in. rubber conveyor belts at 35 ft. per minute, the waste rock being sorted out and dropped into convenient chutes.

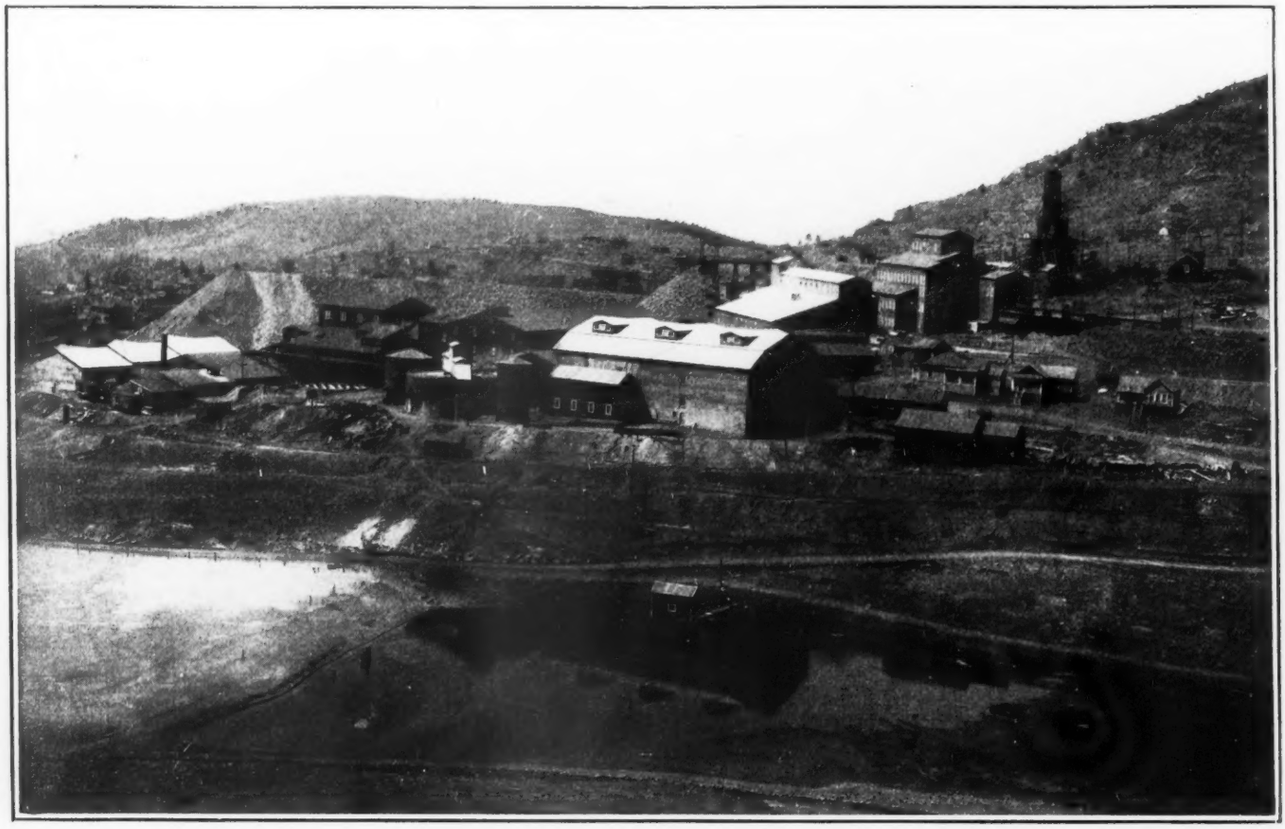
own hydro-electric plant on the Spanish River. Altogether, something like $10,000,000 will be expended in the next five years in improvements and expansion, it is said.

Incidentally, vast improvements have been made in the refining methods employed at the Port Colborne plant, situated on the Welland canal, several hundred miles south of the smelter. The old Orford process is being displaced by an electrolytic process that is cheaper, makes a better grade of nickel, and recovers the precious metals of the platinum group which are even more plentiful in the Frood deposit than in the ore from Creighton. The product of the smelter at Copper Cliff is a "white metal" consisting of approximately 25 per cent copper, 55 per cent nickel, and 20 per cent sulphur. This is shipped to the refinery, and in the Orford process has been treated somewhat as follows: It is first smelted in a blast furnace with salt cake (sodium sulphate) and coal, the fused product being withdrawn and cooled. As it cools it separates into two layers, the upper one consisting of most of the copper in the form of double sulphides of sodium, copper, and iron; and the lower one of most of the nickel, with a little copper and iron, in the form of a matte. The nickel "bottoms" are given a second blast-furnace treatment to make the separation more complete, and then the nickel is refined by successive steps of roasting with salt and leaching, with a final roast to form the oxide of nickel. This is reduced in an oil-fired furnace to form ingot metal of slightly better than 99 per cent purity. The so-called copper "tops" from the blast-furnace treatment are smelted in a converter, and the blister copper thus made is shipped to one of the large electrolytic copper refineries in northern New Jersey.

Important economies in eliminating the costly successive steps of roasting and leaching in refining the nickel are made possible by the new process. The nickel matte from the blast-furnace treatment—the second nickel bottom—is merely roasted to remove the sulphur and charged into an anode furnace fired by coal. The anodes are then refined electrolytically, producing nickel of unprecedented purity, and saving the platinum metals. A typical analysis will indicate the purity of the nickel being made by this improved process: Ni, 99.92 per cent; Fe, 0.04; Cu, 0.02; C and S, trace. The metal contains about 0.5 per cent cobalt, which is included with the nickel in this analysis, the two metals having the same characteristics and value for most purposes. The first of four units, each having a capacity of 750,000 lb. per month, is now in operation. The others will be built, and will add greatly to the efficiency of the metallurgical operations.

This brief picture of the International Nickel Co.'s operations will afford an insight into why it has been so interesting to mining engineers and why investors have come to look upon it so favorably. Time, of course, will be required to bring present plans to fruition—two or perhaps three years; but it is better to have the best ahead than to be obliged to look back at the good old times, as many mining companies must. The president of the company, Robert C. Stanley, and those under him can look with pardonable pride at what has been accomplished in the last seven years, following the lean days at the close of the war. It would seem that Nature, half a mile underground in the Frood mine, has justly rewarded them.

Independence mill of the Portland Gold Mining Co., Victor, Colo.



Scandinavia's Iron-Ore Reserve 4,600,000,000 Tons

By Olin R. Kuhn
Donner Steel Co., Buffalo, N. Y.

THE IRON ORES OF NORWAY are of special interest to the British ironmakers, because the country has a considerable reserve of iron ore, but practically no coal, and is compelled to export nearly all of its iron-ore production; also because its geographical position gives it marked advantages, particularly as a source of supply to the ironmakers on the east coast of England. Norway possesses several large deposits of titaniferous iron ore which may well come into use at some future time. The main supply at present, however, is in the low-grade magnetite ores, which have to be crushed and concentrated to render them available for use in the blast furnace.

England has always been Norway's best customer in iron ore, although Germany, especially in recent years, has been a fairly large purchaser. Twelve to fourteen years ago Norway produced from 500,000 to 700,000 tons of iron ore annually, but after the World War the production dropped to less than 100,000 tons. It is now almost back to normal. Practically the entire iron-ore output is exported to England and Germany, Norway producing less than 10,000 tons of pig iron annually.

The iron ores of Norway are usually classified as concentrating ores, direct-smelting ores, titaniferous ores, sulphide ores, and ores from southern Norway.

CONCENTRATING ORES—The concentrating ores of Norway are known to extend over a large area, mainly in Vesenfjord in the south and at Sydvaranger in the north. Deposits at Sydvaranger, Vesteraalen, and Lofoten Islands occur in granite rocks and are generally magnetite with occasionally some specular hematite. Deposits occurring in stratified rocks are found at Dunderland, Vefsenfjord, and a few other localities.

The Sydvaranger deposits occur in northern Norway on the peninsula between Longfjord and the Pasvik River. Ore deposits here are generally steep, with a dip of about 75 deg. The ore consists of quartz, epidote, and hornblende carrying magnetite, with practically no specular ore, and minute quantities of iron pyrites. Deposits in this district are estimated by the Imperial Mineral Resources Bureau and by Max Roesler to contain more than 100,000,000 tons of crude ore averaging about 36 per cent iron, 0.04 per cent phosphorus and sulphur, 0.25 per cent manganese, and only 0.1 per cent titanic acid. Waldemar Lindgren estimates the reserve of these deposits at 115,000,000 tons, but he includes the ore that will have to be mined underground.

The Sydvaranger company, which operates in this district, has a concentrating plant at Kirkenes which will treat over 2,500,000 tons of crude ore annually, with a production of about 900,000 tons of concentrates carrying 65 to 68 per cent iron, 5.5 to 6.5 per cent silica, and rarely more than 0.01 per cent phosphorus. This company also has a briquetting plant with an annual capacity of 450,000 tons. Other deposits of this type of ore in northern Norway are found at Fiskefjord, Blokken, Gullesfjord, and Okefjord, in the Vesteraalen and Lofoten Islands, but so far as known these deposits are small and none has yet been opened up or worked.

DUNDERLAND'S DEPOSITS are found along the valley of the Dunderland River, and most of them are held by the Dunderland Iron Co. There are fourteen or fifteen deposits in this group, with an available reserve for open-cast mining of 89,000,000 tons of ore averaging about 39 per cent iron and from 10 to 60 per cent silica. This ore is hematite and magnetite and is concentrated at Storfhei. Other deposits of this type are found at Fugestrand, Seljelid, Elsfjord, Naeverhaugen, and Sjaafield, but none of them is thought to be very large. Lindgren puts the reserve of the Dunderland and smaller deposits at 150,000,000 tons and Vogt estimates them at 120,000,000 tons of available ore, which probably includes some underground mining ore. H. J. Geissel in 1910 estimated the reserve of the Dunderland deposits at 840,000,000 tons, of which 200,000,000 tons was high grade, but probably a great portion of this tonnage was only possible ore and in no way proved.

Table VIII—Analysis of Sydvaranger Iron Ore

	Crude Ore, Per Cent	Concentrates, Per Cent
Iron	35.00 to 37.00	66.25
Silica	43.00 to 45.00	6.30
Alumina	0.50 to 1.10	0.44
Sulphur	0.01 to 0.06	0.012
Phosphorus	0.08 to 0.10	0.012
Lime	2.10 to 3.00	0.60
Magnesia	2.20 to 2.50	0.44

Deposits of magnetite ore have been opened at Strand and Bervik and a concentrator was built to take care of 350,000 tons of crude ore annually, but from 1907 to 1917 only 61,400 tons of concentrates was produced. These deposits are now controlled by an English company.

The Narvik deposits, near the port of Narvik, contain two large lenses estimated to contain about 10,000,000 tons of ore workable by open-cast methods and without excessive overburden. This ore, however, is a low-grade magnetite carrying only 20 per cent iron and about 1 per cent phosphorus. Some trial work has been done on this and neighboring deposits, but they are considered too poor for profitable working at present.

Another group of deposits—namely, the General-

Concluded from the Aug. 20 issue.

haugen, Storhaugen, and Loukostjokka—is situated north of Soveien. This group probably contains about 15,000,000 tons of magnetite ore. This ore, however, is low in grade, carrying only about 16 per cent iron, and it is rather high in phosphorus and sulphur. The property was acquired by a German concern, and a concentrator was built at Langnaesset to treat 600,000 tons of crude ore annually, but the venture proved unprofitable and the plant was abandoned.

Small deposits of magnetite ore occur at Sorreisen which are estimated to contain from 5,000,000 to 15,000,000 tons of ore carrying 25 to 33 per cent iron with about 0.25 per cent phosphorus and 0.1 per cent sulphur, but they are not developed at present.

Several rather extensive deposits of iron ore are known at Tromsosund, Mollendalsakeln, Solligangen and Langgangen, which are said to contain about 20,000,000 tons of crude ore. This ore is a low-grade magnetite with a little specular hematite and contains about 25 per cent iron and 0.4 per cent phosphorus. A fair amount of development work has been done on them, but owing to the grade of the ore they are not thought to be economically remunerative under present concentrating methods.

TOTAL RESERVES of the concentrating ores in Norway are estimated at somewhat more than 300,000,000 tons, which should yield from 125,000,000 to 150,000,000 tons of concentrates running about 65 per cent iron. The possible, or potential, reserve is large and can be put at about 1,250,000,000 tons, although most of it is low-grade ore.

Table IX—Concentrating Ores of Norway

District	Reserve of Crude Ore, Tons
Sydvaranger	115,000,000
Dunderland	150,000,000
Narvik	10,000,000
Generalhaugen	15,000,000
Sorreisen	15,000,000
Tromsosund	20,000,000
Total	325,000,000

Titaniferous iron ores are found in several parts of Norway, but, with the exception of one or two deposits, none of them has been developed as yet, owing to the lack of demand for this type of ore. The largest deposits occur on Lofoten and Vesteraalen islands and at Solnordal, although smaller deposits also occur around Soggendal and Rodsand.

Deposits between Ekersund and Soggendal consist essentially of irregular masses of ilmenite. The ore runs about 40 per cent iron, with about the same amount of titanic acid, and is low in silica. The Blaafield mine is the best known in this group and has been worked in the past. This mine shipped about 100,000 tons of ore to England between 1865 and 1875. Other mines in this group of deposits are Koldal, Kyland, Storgangen, and Laksedal. These deposits are estimated to contain a reserve of only about 500,000 tons.

Deposits at Rodsand, in southern Norway, have been worked to some extent in the past and experiments have been made in concentrating the ore to increase the iron and reduce the titanium content, but the deposits have never been worked to any great extent. The crude ore carries 46.5 to 51 per cent iron and from 6.5 to 8.5 per cent titanic acid. The concentrates run about 64 per cent iron and only 2.5 per cent titanic acid. These deposits are estimated to contain a reserve of only 500,000 tons.

Much larger deposits of titaniferous ore occur at Soholt in Orkoug and at Solnordal, near Skodje. The ore here is in narrow lenticular deposits in gabbro and is of considerably higher grade than the other deposits, running about 50 per cent iron and 14 per cent titanic acid. These deposits are estimated to have about 5,000,000 tons of ore. Other small deposits of ore of similar character are found at Orien, Raddal, Sellevold, Loland, Lavikdal, and Bergen.

The largest known deposits of titaniferous ore in Norway occur on the Lofoten and Vesteraalen islands. These deposits are estimated to contain about 15,000,000 tons of magnetite ore that can be worked by open-cast methods. This ore, however, is relatively low in grade, averaging only about 33 per cent in iron and 4 per cent in titanic acid.

Table X—Analyses of Titaniferous Iron Ores in Norway

	Soggendal, Per Cent	Rosand — Crude, Per Cent	Rosand — Concen., Per Cent	Solnordal, Per Cent	Lofoten Islands, Per Cent
Iron	39.80	46.5—51.0	64.00	48.00	32.0—35.0
Phosphorus	0.01—1.0	0.02	0.01	10	0.03—1.30
Silica	0.60	10.0—15.0	2.50	3.25	.....
Sulphur	Trace	0.9—1.20	0.62	Low	0.20
Alumina	0.60	6.90	0.94	9.50	.....
Lime	0.55	1.20—2.0	1.20	....	.....
Magnesia	3.15	1.83—2.00	0.77	5.00	.....
Titanic acid	41.10	6.50—8.50	2.50	17.00	4.00

Reserves of titaniferous iron ore in Norway can be put at from 20,000,000 to 25,000,000 tons of known and probable ore averaging between 35 and 45 per cent in iron. Roesler estimates the possible additional reserve of this type of ore at about 44,000,000 tons.

DIRECT-SMELTING ORES—A number of iron-ore deposits in Norway can be classed as direct-shipping or smelting ores—that is, the ore is rich enough to be used without concentrating. This ore consists essentially of magnetite with a very little specular hematite. The principal deposits of this type of ore are found on Lofoten, Vesteraalen, and Hindo islands, at Fiskefjord, Beitstadfjord, Klodeberg, and on the islands of Lango and Gomo.

Deposits of this class on Lofoten and Vesteraalen islands run 55 per cent iron and from 0.03 to 0.05 per cent phosphorus. But the ore is generally high in sulphur, sometimes up to 1 per cent. Similar deposits have also been worked on the islands of Melovaer and Bjarko, but on account of the high sulphur content only a small tonnage has been removed. No reliable estimates of the reserve have been made.

Table XI—Reserve of Titaniferous Ores in Norway

District	Reserve, Tons	Iron, Per Cent
Soggendal	500,000	40.00
Rodsand	500,000	46.50
Solnordal	5,000,000	50.00
Lofoten and Vesteraalen islands	15,000,000	33.00
Total	21,000,000	

On the island of Hindo there is a deposit of low-grade ore impregnated with iron pyrites, but it will have to be wet-concentrated before it is suitable for furnace use. It is estimated that about 500,000 tons exists in the Rodhammern deposit alone, and another deposit at Kjaegsnaes is said to contain a like amount. Probably 1,500,000 tons of ore is scattered on the island. These ores average only about 28 per cent iron in the crude ore, but the concentrates run about 67 per cent.

At Fiskefjord a number of deposits are estimated to contain about 2,000,000 tons of specular ore averaging 45 per cent iron and 19 per cent silica. It is doubtful whether these deposits are of value under present mining conditions because of their size and the necessity for working them underground.

Some deposits of ore occur near Beitstadfjord which are estimated to contain at least 7,500,000 tons. The most important are the Holdenfelt, Follafelt, Simadalsfelt, Hararsfelt, and Amundfelt. This field has been developed only recently and the ore contains up to 55 per cent of iron and variable phosphorus. The higher-grade ores can be shipped direct, but those of lower grade are concentrated and the concentrates carry 66.5 per cent iron.

AT KLODEBERG there is an old mine that has been in operation for about 300 years and that still contains about 500,000 tons of ore that will average 42.5 per cent iron and 25 per cent silica, it is said. By hand picking, the iron in this ore can be increased to 48 per cent. This mine has a capacity of only 20,000 tons of ore annually.

Several old mines on the islands of Lango and Gomo, near Kragero, have been worked at intervals since the seventeenth century, and according to report still contain about 1,000,000 tons of ore carrying 40 to 45 per cent iron and 30 per cent silica. The grade of this ore can be raised by hand picking to 52 per cent iron and 4 per cent silica. The ore is essentially a hematite.

Table XII—Direct-Smelting Ores of Norway

District	Reserve, Tons	District	Reserve, Tons
Island of Hindo	1,500,000	Klodeberg	500,000
Fiskefjord	2,000,000	Lango, Gomo	1,000,000
Beitstadfjord	7,500,000		
Total			12,500,000

Actual reserve of the so-called direct-shipping ores is small when compared with the concentrating ores of Norway. Roesler estimates the known and probable reserve of the former at 35,000,000 tons and the possible reserve at about 31,000,000 tons additional. Vogt puts this tonnage at only 9,000,000 tons and 10,000,000 tons respectively. The reserve at the deposits given above show an actual reserve of 12,500,000 tons, with a possible reserve of about 55,000,000 tons.

SULPHIDE ORES—Deposits of iron and copper sulphide are found at Sulitjelma which on roasting produce, as a byproduct, an iron ore running about 62 per cent iron. Roesler estimates these deposits to contain about 17,000,000 tons of known ore carrying 10,500,000 tons of metallic iron and 10,000,000 tons of possible ore.

Deposits of Southern Norway

Small deposits of hematite and magnetite ore are found in southern Norway in the Christiania (Oslo) district at Fehn, Kragero, Nissedal, and Arendal. These deposits are contact deposits of igneous origin and the ore contains about 50 per cent iron. Vogt estimates the reserve at 8,000,000 tons of actual ore and 7,000,000 tons of possible ore.

Norway's iron-ore reserves are not nearly so large as those of Sweden, and the greater part of the ore is low in grade, requiring concentrating before it is suitable for furnace use. The actual reserve of iron ore in Norway can be put at about 400,000,000 tons and the possible ore at about 1,366,000,000 tons.

Finland

THE greater part of Finland is a mass of ancient crystalline rocks covered with glacial drift. A few iron-ore deposits are known, but much of the country is still unexplored. The known deposits occur at Kittila, Suojarri, Valimaki, Jussaro, and Pitkaranta, although information as to the reserves of some of these deposits is sadly lacking.

Table XIII—Iron-Ore Reserves of Norway

Kind of Ore	Actual, Tons	Possible, Tons
Concentrating ores	325,000,000	1,250,000,000
Titaniferous ores	21,000,000	44,000,000
Direct-smelting ores	12,500,000	55,000,000
Sulphide ores	17,000,000	10,000,000
Southern Norway ores	8,000,000	7,000,000
Total	383,500,000	1,366,000,000

Kittila's deposit is in northern Finland about 100 miles north of Rovabiemi. The ore here is magnetite and contains about 40 per cent iron and from 0.15 to 0.50 per cent of phosphorus. Two bands of ore, 900 and 1,500 ft. wide, have been traced for about 7 miles, although little is known as to the size of the reserve except that it has been stated that there are "exhaustless quantities" of ore here, but this estimate is probably greatly exaggerated. The deposits are in a large part privately owned, but some of them belong to the state. Other deposits have been found at Jurakaisenmaa, which have been recently surveyed and the ore followed for about a mile. These bodies are 6 to 10 ft. thick in places and the ore carries from 40 to 55 per cent of iron.

Beds of hematite ore from 4 to 5 ft. thick occur at Suojarvi, in southeastern Finland, which have been traced for a distance of several miles. The ore in these deposits averages about 50 per cent iron, but the deposits have never been worked.

Table XIV—Various Estimates of Norway's Ore Reserves

Estimated by	Year	Actual, Tons	Possible, Tons
Tornebohm	1905	1,000,000,000	.....
J. H. L. Vogt	1910	365,000,000	1,545,000,000
W. Lindgren	1918	21,000,000	.....
F. H. Hatch	1920	350,000,000	.....
Max Roesler	1921	374,000,000	903,000,000
Imperial Mining Resources Bureau	1922	343,500,000	.....
Miscellaneous	1926	383,500,000	1,366,000,000

At Valimaki, near the Russian frontier, titaniferous beds of magnetite ore occur which contain only about 23 per cent iron. These deposits were worked to some extent between 1896 and 1907, and about 100,000 tons of concentrates was shipped to Russian furnaces, but no estimates are available as to the present reserves.

At Jussaro, in southern Finland, there are lenses of magnetite which pitch under the Gulf of Finland and which have been explored to some extent by magnetic surveys. These deposits are estimated by Roesler to contain about 30,000,000 tons of ore carrying 27 per cent iron.

IRON-ORE deposits at Pitkaranta are magnetite ores of concentrating grade which run about 38 per cent iron. These ores, however, are high in sulphur, containing more than 1 per cent, and the reserve is estimated at 13,500,000 tons of known ore and 7,000,000 tons of possible ore.

Table XV—Iron-Ore Reserves of Finland

District	Actual, Tons	Possible, Tons	Per Cent Iron
Kittila	Unknown	Unknown	40
Suojarvi	Unknown	Unknown	50
Valimaki	Unknown	Unknown	23
Jussaro	30,000,000	.....	26
Pitkaranta	13,500,000	7,000,000	28
Total	43,500,000	7,000,000	

Because of the lack of information, probably only a small part of Finland's iron-ore reserves has been estimated. More orebodies of the Kittila type may possibly

be discovered in northern Finland by further prospecting, inasmuch as the country is similar to that of northern Norway, in which such ores are so generally distributed.

Finland has not heretofore been a producer of iron ore and has no iron industry, although the Director of the Geological Survey of Finland is of the opinion that in view of the abundance of water power in that country the electrical smelting of iron may become an important industry in future years. An output of 5,200 tons of bog ore was reported in 1913, 3,000 tons of magnetite in 1918, 12,700 tons in 1921, 1,200 tons in 1922, and 1,000 tons in 1923.

The Scandinavian countries contain an area of about 447,600 square miles, or about 0.23 per cent of the area of the entire world, but they contain an iron-ore reserve of 4½ per cent of the world's supply. They produce many times more iron ore than they consume and the surplus is exported generally to England and Germany, where it is mixed with the lower-grade domestic ores. At the rate at which ore is being produced at present in the Scandinavian countries the reserve should last more than 300 years.

Table XVI—Iron-Ore Reserves of the Scandinavian Countries

Country	Actual Reserve, Tons	Possible Reserve, Tons
Sweden	2,303,350,000	500,000,000
Norway	383,500,000	1,366,000,000
Finland	43,500,000	7,000,000
Totals	2,730,350,000	1,873,000,000

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Safety Dogs for Hoisting Timber and Lagging

These dogs are used by the Anaconda company in handling lagging. They differ somewhat from those used in handling timber. Made of heavier material, they do not bend as readily when driven into the lagging.

Anaconda uses these safety dogs when hoisting or lowering timber. The dogs are ordinarily made of material about ¾ in. x 1½ in. and are about 8 in. in length. The general construction and method of use is shown.

Courtesy U. S. Bureau of Mines

Portable Crushing Plants

By W. T. W. Miller
Engineer in Charge, Crushing Machinery Department, Hadfield's Limited, Sheffield, England

IN SMALL QUARRIES and gravel pits, for concrete work of all kinds, and, in many instances, for road construction and maintenance, the light, portable crushing unit is being used to a greater extent every year. The number and variety of these outfits have already multiplied beyond common knowledge. The following

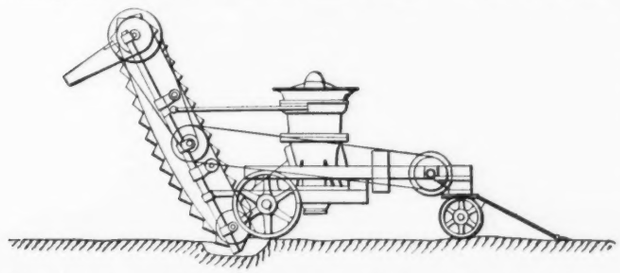


Fig. 1—A portable gyratory crushing outfit with elevator attached

brief description of the machines in use, with a summary of the special features in the various designs, may prove of interest.

Those crushers that are mounted on the carriages may be either of the jaw or gyratory type. The former is usually chosen when the output required is small; the latter is better suited for gravel pits and semi-stationary plants.

The gyratory machine of moderate capacity has usually a very narrow feed mouth, and is therefore not capable of taking such large stones as a jaw crusher with a similar output. Also, the gyratory is higher than the jaw breaker and is both more cumbersome to mount and more difficult to feed. Its wearing parts are not easily removable and it is usually necessary to excavate a pit below the plant to allow sufficient space to remove the bottom cover when gears or eccentric bearing must be renewed.

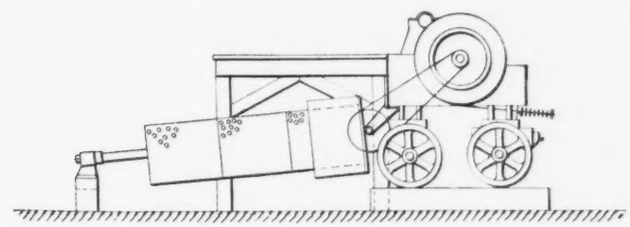


Fig. 2—The simplest form of a portable crushing unit, fitted with a removable tail screen. The screen must be set up anew every time the breaker is moved

Fig. 1 illustrates a portable gyratory outfit with elevator attached. When the material is discharged into a screen placed above storage bins, the elevator must be lengthened, and it is usually made collapsible, and in some of the semi-portable gravel plants an inclined belt conveyor, on an independent carriage, is used for feeding the machine, a short screen chute being interposed between the head drum and the gyratory hopper to extract any material already of the desired size.

The gyratory crusher is especially suited for gravel crushing because the boulders rarely reach a size in excess of the width of the feed mouth and because its large capacity is an advantage in case of irregular feeding or an extra proportion of pebbles.

The simplest form of a portable unit consists of a jaw breaker with fixed brackets attached to two of the feet to carry a fast axle and a swiveling turntable bolted to the other two feet to support the free axle at the shaft or drawbar end of the bogie. Should it be necessary to screen the crushed product, a removable tail screen is fitted, as indicated in Fig. 2. The brackets for supporting the shaft at the feed end of the screen, also the bearings for the counter shaft and the feed chute, are all attached by bolts to the breaker frame, but the tail bearing at the outlet end of the screen has to be carried on an independent support.

When the breaker is moved, the screen must be lifted out of its bearings and placed in a wagon, so that the

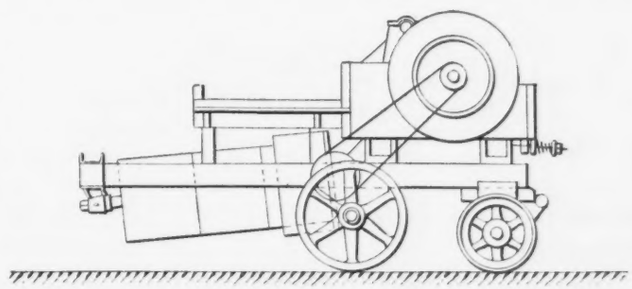


Fig. 3—A further step in the evolution of a portable outfit. Here the screen is movable with the crushing unit

plant is not portable as a working unit, the screen having to be refitted and a support found for the tail bearing at each new working position.

The one advantage of this combination lies in the fact that a long screen can be attached, and, when a considerable number of different perforations are required, a sufficient length of each size can be used to insure satisfactory separation of the various grades. There is, however, always one difficulty when the screen is placed immediately below the crusher outlet—namely, either the breaker must be lifted to some height above floor level or the screen must run very close to the ground line. When the breaker is lifted up it is difficult to raise the stone to feed level, and if the screen is too low there is very little space for collecting the screened material. By inserting packings underneath the wheels and cutting a trench or pit below the screen the storage room may be increased.

The next step in the evolution of the portable outfit is shown in Fig. 3. In this plant the breaker is placed on a channel steel underframe, to which the rear axle and

the turntable for the swiveling axle are attached. This underframe is extended to carry the tail bearing for the screen and support a short platform to receive the stone to be crushed. In a plant of this type the screen should

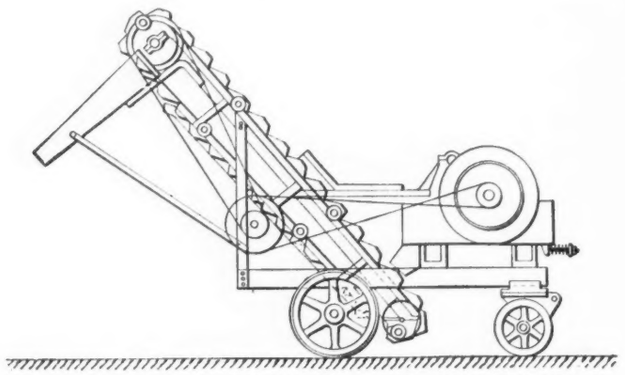


Fig. 4—In this plant the manual labor usually necessitated by the underhung screen is done away with through the use of the elevator

not be made too long, or the combination becomes unwieldy for road transport and unstable when at work. It is therefore rarely possible to obtain more than two sizes of holes in the main body of the screen, with a short outer jacket for smaller perforations at the inlet end.

Here again the screen must either come close to the ground or the breaker be lifted to a considerable height from the floor level. When traveling on rough roads the tail end of the screen is likely to become damaged. To prevent this some makers hinge the frame near the center, so that the screen may be lifted into a vertical position clear of all possibility of damage.

The great disadvantage of the underhung screen is undoubtedly the fact that the sized material must be shoveled into cars or barrows, entailing an expensive amount of manual labor. The plant shown in Fig. 4 is designed to overcome this: an elevator is introduced to raise the crushed product to such a height as will permit of automatic loading into the wagons, and, in some instances, a grizzly chute or a small revolving screen is attached to the head of the elevator to remove the fines, if these are not desired in the finished product.

The elevator may be made collapsible, so that the extra height does not give trouble during transportation, but the screening facilities are poor, and no real storage is

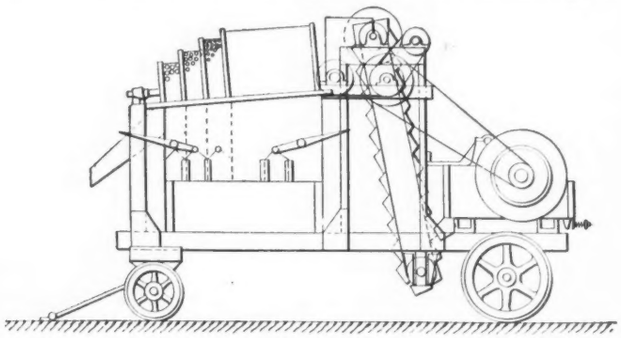


Fig. 6—Provision of adequate screening area has been attempted in the design of this plant

possible to tide over the intervals occupied in moving the cars or wagons, unless a set of portable bins with separate screen are provided for this purpose.

A combination plant, shown in Fig. 5, has several features of interest, and a considerable number of these machines, having a capacity of eight to ten tons per hour to 2-in. ring, have been used for many years by road authorities in the British Isles and on the Continent. This plant is usually fitted with two screens, one placed directly under the outlet chute from the breaker and the other carried on two frame uprights above the loading hoppers which form part of the structure. The lower screen is used for removing the dust and fine stone, which falls on the ground, the bulk material passing into a revolving drum forming the receptacle for an internal-bucket elevator which lifts the larger stone into the upper screen, where the main separation takes place. Side-discharge hoppers are arranged under this top screen with outlets at such a height that delivery may be made into carts.

The feed platform is situated below the sloping underside of the storage hoppers, and the screens are arranged in such a way that all oversize material is automatically returned to the breaker, the plant operating in a closed circuit. In the plant shown, the internal-bucket elevator is plated inside to protect the belt against the wear of the stone and is fitted with buckets of special shape designed

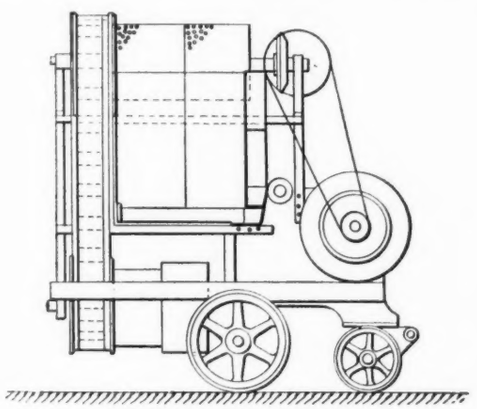


Fig. 5—Combination plant with two screens, elevator, and side-discharge hoppers

to insure satisfactory discharge into the feed chute for the upper screen. The plant is driven by belt from the breaker shaft to the countershaft for the top screen. The main shaft of this screen carries the upper elevator drums, and the elevator belt transmits the power necessary to insure rotation of the lower screen.

A plant of this kind can be constructed with a short wheel base, and, if fitted with broad wheels, can readily be transported through narrow lanes and over boggy ground. It is usually driven by a steam roller, tractor, or traction engine, which is also capable of hauling the outfit from place to place.

A common failing in all portable plants is the lack of adequate screening area, and this is particularly noticeable when the product has to be separated into four or more grades. The plant illustrated in Fig. 6 includes a special type of concentric screen comprising four cylinders of increasing diameter, and the surface area is the maximum possible within the limits imposed by the length. Storage hoppers are small, being intended merely to permit the changing of the hand barrows.

Breaker, elevator, and screen are arranged in a straight line on an extended carriage with a rather long wheel base. The feed space is restricted by the upward

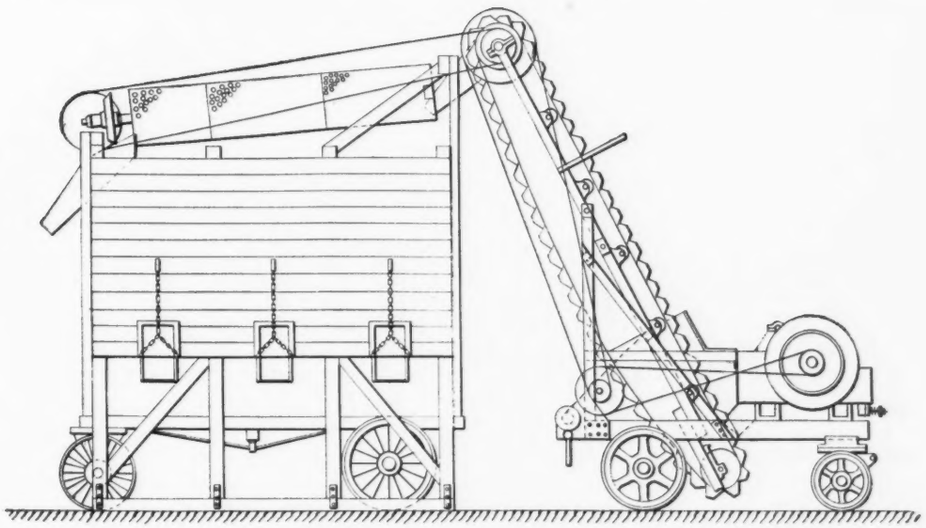


Fig. 7—This more elab orate plant is designed with a view to providing the greater storage capacity afforded by the separate hopper unit

strand of the elevator, and the stone must be introduced by side chute. No means are provided for returning the oversize, which falls to the ground at one end.

Storage capacity in any self-contained unit must, of necessity, be limited, and the various grades of stone must be removed as quickly as possible, or the small hoppers will fill up to screen level. This defect has led to the introduction of the more elaborate combination illustrated in Fig. 7, in which a breaker and elevator unit such as shown in Fig. 1 or Fig. 4 is used for feeding a screen fitted above a set of wooden or light-steel bins which are mounted on a separate undercarriage. Sometimes the hoppers are lowered on to this carriage for transport purposes and racked up to the necessary height for discharging into wagons when the plant is at work. In another design the bins are lowered on fixed uprights so that the weight is taken off the wheels before the hoppers are filled with stone.

The elevator is driven from a countershaft which is coupled by belt to the main shaft of the breaker, and the screen is rotated by means of a chain from the elevator headshaft. It is not always easy on rough ground to insure correct alignment of the two portions of the plant, and the chain drive is most suitable.

When the breaker is lifted on wheels the feed mouth is raised some considerable distance, making it more difficult to maintain a constant and regular supply of stone than in a fixed plant where the crusher can be set with the mouth level with the ground line. To overcome this difficulty an incline may be laid so that the small quarry wagons can be run directly over the feed chute. In Australia the portable crushing plants are fitted with a light haulage drum operated by clutch from the breaker shaft and a track is laid on collapsible trestles, by which means the small side-tip wagons can be hauled up the incline and tipped straight into the chute in line with the feed mouth of the breaker as shown in Fig. 8.

There have also been several attempts to fit elevating skips similar to those used with concrete mixers for feeding the crusher from floor level, but these contrivances have not yet come into common use.

For some years efforts have been made to include the driving medium on the carriage with the crushing plant, and the development of the gas engine has enabled this to be done without increasing the weight beyond the limits convenient for transport. This system is more applicable to the smaller units than to the heavy combination plants, which are still usually driven by petrol or steam tractors, but a small jaw machine with screen attached can be driven quite satisfactorily, as in Fig. 9.

The engine power should be well above the normal working load, and the speed should be moderate, so that the ratio of reduction for the drive is not excessive. The engine may be cooled by water tanks or by radiator, as shown in the illustration, and a clutch of some kind must be provided, so that the engine can be started on a free shaft. The atmosphere in the neighborhood of a plant of this nature is impregnated with dust, which is frequently abrasive, and the engine should be housed inside a dust-proof casing. Means must be provided also for screening out the dust at the air inlet.

In some rare instances, notably in connection with road-bed repairs on electric tramways, an electric motor is used in place of the gasoline engine. This makes a

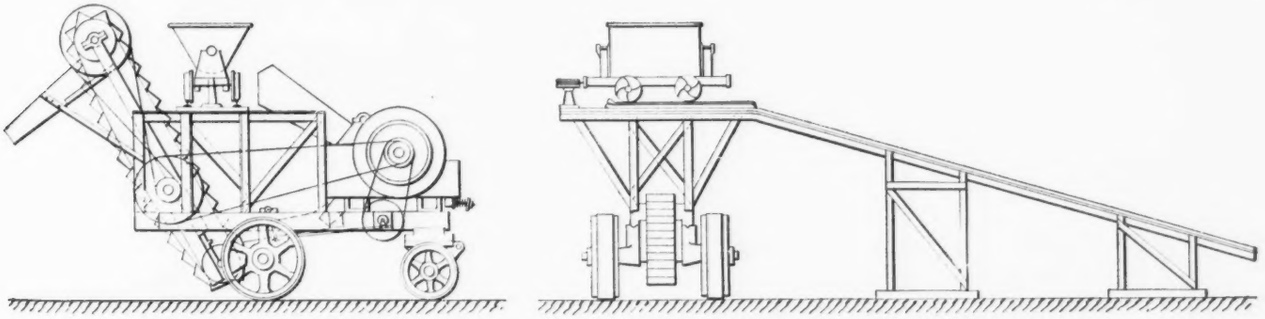


Fig. 8—The incline shown in this plant is provided to permit a regular and constant feed to the crusher

very satisfactory combination, since the motor can be totally inclosed to exclude the dust.

When the power unit is carried on the chassis with the crusher it is natural to attempt to make the vehicle

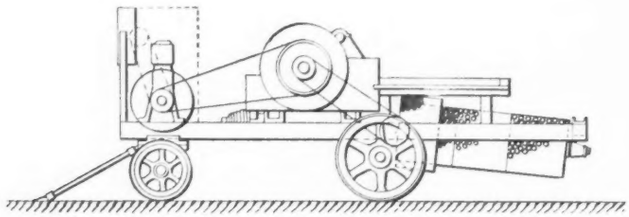


Fig. 9—Here the gas engine driving the unit is mounted on the carriage with the crushing plant

self-propelling, and a plant of this kind is shown in Fig. 10. In this case the breaker is mounted on the framework of a gasoline truck, and an intermediate cross-shaft is fitted to transmit the motive power to the crusher shaft. Incidentally, also, this same shaft operates a small jib crane used for hoisting a skip full of stone to the feed hopper above the breaker; but this is a somewhat unusual feature.

Adaptation of a motor-car chassis is rarely successful for this purpose. The engine and radiator are not well suited for continuous running in a stationary position at close to maximum rating. Such conditions are much more exacting than the variable loading which obtains under normal traffic. The location of the engine, with the crank shaft at right angles to the breaker shaft, introduced complications in the second motion shafts, and the drives and clutches are badly situated in close proximity to the crusher.

No doubt, further experience with plants of this nature will lead to the development of special machines for this purpose. As matters stand at present, however, the separate tractor on its own wheels is not only more reliable but will be found more generally useful, as, in the event of the plant standing idle, the engine may be used for other work.

Although specially applicable to road construction and maintenance, portable plants are occasionally used on the railways, either for ballasting new lines or furnishing material for concrete work.

With greater facilities for the transport of heavier pieces of machinery, the dimensions of a portable outfit for travel on the railways may be far in excess of those which are compelled to traverse the highways. Fig. 11 illustrates a double bogie truck carrying boiler, steam engine, gyratory crusher, elevator, and discharge chutes, with all necessary transmission gear. A combined plant of this character is particularly serviceable where wood fuel is available and where supplies of crushed stone are unobtainable within any reasonable distance.

Local conditions have always a great influence on the design of portable plants. In many instances the height must not exceed the clearance under existing highway or railway bridges. Again, in some of the older towns where streets are narrow and turns are sharp, any excessive length of wheel base must be avoided, and where roads are bad the weight on the wheels must be kept low.

In hilly districts the plants should be carefully balanced. Otherwise the pull on the drawbar combined with the displacement of the center of gravity will cause the outfit to overturn, and strong brakes are a necessity.

There is no gainsaying the fact that portable crushing plants have proved their usefulness and that they are of great service under certain conditions. However, when the crusher is required to operate for any length of time in one position, the portable combination cannot be said to compare favorably with a well-designed fixed plant, either from the point of view of cost of operation or from the standpoint of low cost of maintenance.

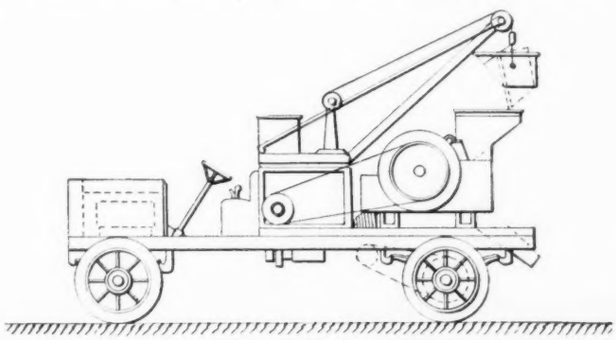


Fig. 10—This plant is self-propelled. The gas engine is also employed to operate the small jib crane

Frequently the wear in the bore of the road wheels and on the journals of the axles is greater when the plant is crushing stone than when it is traveling on the road. The vibrations cause "chattering," which is more destructive than rotation under load. To overcome this trouble some engineers remove the traveling wheels when the plant is stationary and trunnion the axles in vee-blocks laid on baulks of timber. Any crushing machine will run better on a solid foundation than on a flexible underframe, and it is quite possible to design a plant in such a way that it can readily be dismantled and quickly reerected on a new site.

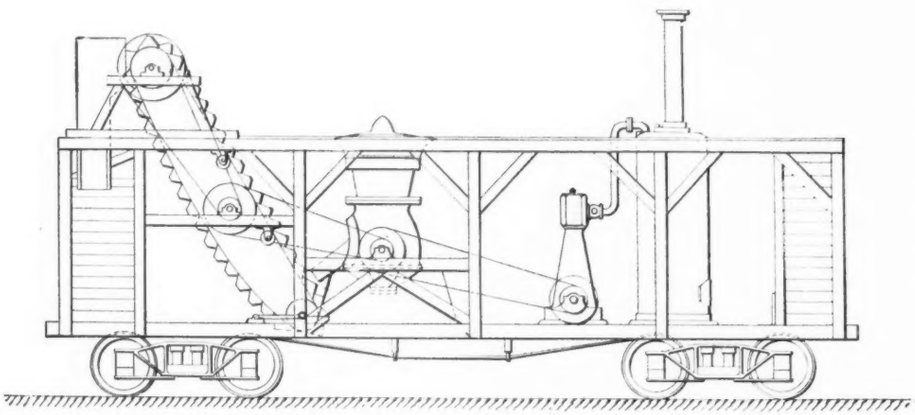
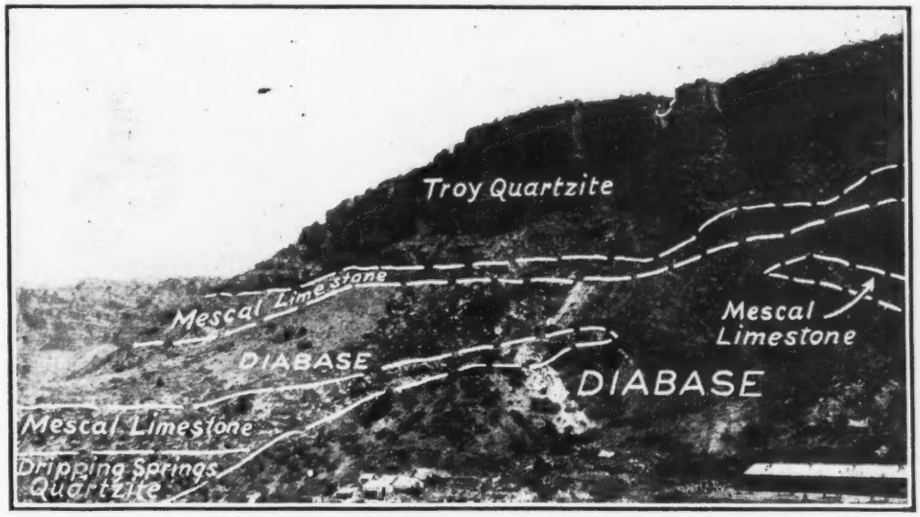


Fig. 11 — This portable crushing plant, designed for transportation on railways, permits dimensions impossible in those intended for highway travel

Asbestos and the Arizona Industry

By Carl Trischka
Bisbee, Ariz.

STRICTLY SPEAKING, the name asbestos should be applied only to the fibrous varieties of monoclinic amphiboles. From a commercial standpoint, however, the term includes a half a dozen minerals, all having a well-developed fibrous structure but differing in physical and chemical properties.



Typical geological column is shown here. The irregular manner in which the diabase has invaded the formations is well illustrated

Commercially, chrysotile, a fibrous variety of serpentine, is the most important kind of asbestos. About 95 per cent of the production of all kinds of asbestos is chrysotile. Other varieties, such as crocidolite and amosite, are contending with chrysotile for the market in certain fields of use, with considerable success because of their greater fiber length and cheapness.

Table I.—Mineralogical and Chemical Relations of Asbestos

Amphibole Group	
Orthorhombic Section	
Anthophyllite (Mg, Fe) SiO_3	
Monoclinic Section	
Tremolite	$CaMg_3(SiO_3)_4$
Actinolite	$Ca(Mg,Fe)_3(SiO_3)_4$
Crocidolite	$Na\ Fe\ (SiO_3)_2FeSiO_3$
Amosite, a silicate of iron, magnesium, and alumina, containing variable amounts of Na and Ca.	
Serpentine	$H_4(Mg,Fe)_3Si_2O_8+H_2O$
Chrysotile	
Picrolite	

Types of Asbestos

In general the asbestos minerals occur in one or more of three types which are recognized as cross fiber, slip fiber, and mass fiber.

Cross fiber occurs in veins which vary in width of from a fraction of an inch to 18-in. The fibers of the vein material lie approximately at right angles to the walls of the vein. Often, however, the fibers run diagonally or are bent by movements subsequent to the formation of the asbestos.

Slip fiber occurs in post-ore fault planes, in layers which ordinarily are not continuous. As a matter of fact, slip fiber is merely cross fiber which has been subjected to faulting and, as a consequence, one type is found to grade into the other.

Mass fiber is found in fibrous bundles or groups that vary in orientation and size. As the name indicates the fibers are matted together in a mass.

Amphibole Group—Anthophyllite occurs in all three types and is the only variety of asbestos of commerce occurring as true mass fiber. In Georgia, where it is quarried, anthophyllite constitutes 90 to 95 per cent of the rock. Because it is harsher and more brittle than other types of asbestos, it is unsuitable for textile purposes. It is used for fire-proof paint, fire-proofing material, and as a cementing material.

Tremolite and actinolite are best considered together, because of their similar occurrence and uses. Tremolite, when fibrous, is sometimes called amianthus. Both of these minerals have the slip-fiber habit, are white or grayish in color, are never associated with serpentine, and fuse at about 2,000 deg. F. In general, they are not suitable for spinning. They are of particular use to the chemist as a filtering medium.

Crocidolite occurs as cross fiber and usually contains several per cent of water and other impurities such as magnesium, calcium, potash, and manganese oxide. The color of crocidolite is its distinguishing feature, black when massive and dull bluish-drab in the fibers, differing thus from all other kinds of asbestos. The length of the fibers averages an inch or two inches, and they are, as a general rule, tough and are used for spinning purposes.

Crocidolite is gradually establishing itself as a com-

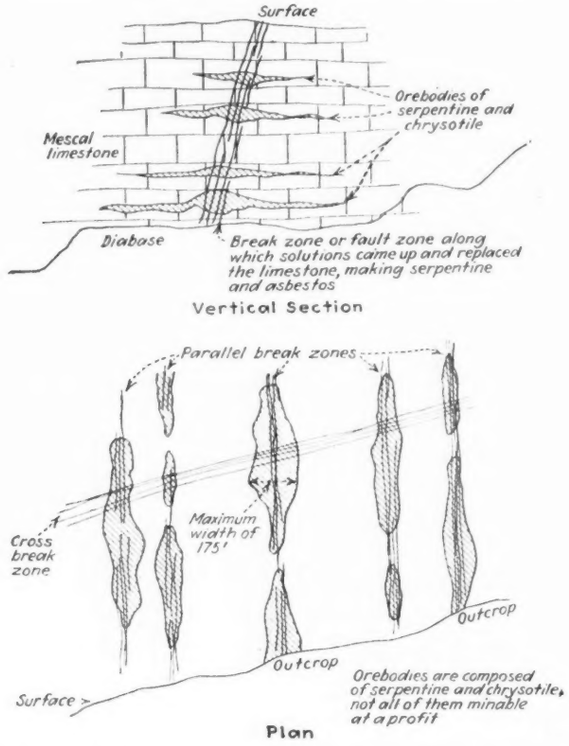
petitor of chrysotile for many of the uses formerly held by chrysotile alone. The fusing temperature is quite low, being about 2,500 deg. F. The crocidolite from Ecuador has been found on examination to be brittle and unfit for spinning purposes, at least from the deposits examined. It is possible, however, that other deposits of this kind of asbestos in Ecuador may be of spinning grade. Crocidolite of commerce comes from South Africa. In the outcrop crocidolite is frequently as hard as adamant. It is considered a semi-precious stone. The yellow variety, of a golden color, is called "Cat's Eye."

Amosite occurs as cross fiber, is greenish or grayish in color, and is notable for its extraordinary fiber length. This is commonly from 3 in. to a foot or even more in length. Its uses are similar to those of crocidolite, and it is another contender for the market in which crysotile

Table II—Number of Asbestos Fibers per Inch

	Fibers per Linear Inch
Chrysotile (Canadian)	250,000
Chrysotile (Arizona)	33,000
Chrysotile (South Africa)	16,600
Crocidolite	14,500
Amosite	9,000

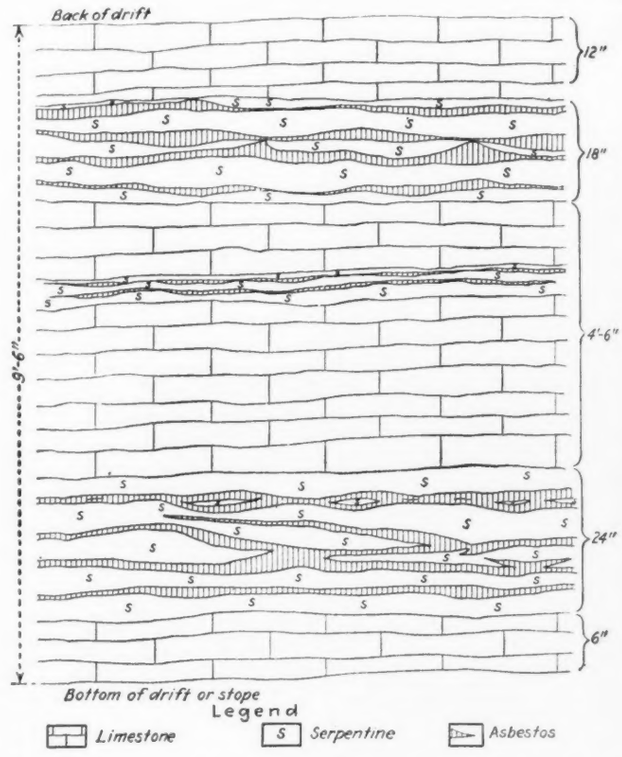
once reigned supreme. It is claimed for amosite that it can stand a temperature of 6,300 deg.F., which is higher than the temperature of fusion of chrysotile. It is further stated that amosite is superior to crocidolite and chrysotile in its resistance to acids, alkali, and sea water. For spinning purposes it is good, but it is lacking in the fineness of its fibers. In this respect, it is outranked by crocidolite and chrysotile, as shown in Table II.


Surface
Orebodies of serpentine and chrysotile
Mescal limestone
Diabase
Break zone or fault zone along which solutions came up and replaced the limestone, making serpentine and asbestos
Vertical Section
Parallel break zones
Maximum width of 175'
Cross break zone
Outcrop
Outcrop
Surface
Orebodies are composed of serpentine and chrysotile, not all of them minable at a profit
Plan

Generalized plan and vertical section of asbestos ore occurrences in Gila County, Arizona

The spinning machinery in the United States is generally adapted for fibers not exceeding 2 or 3 in. in length, and for this reason amosite is cut up by the distributors to suit the requirements of the spinners.

Serpentine Group—Chrysotile, or crystallized serpentine, with variable amounts of water of crystallization, is distinguished from the amphibole varieties by having this water. In color it is greenish, pinkish, yellowish,



Typical commercial occurrence of chrysotile in Mescal limestone, Gila County, Ariz.

gray, and white, and it varies from extreme silky toughness of its fibers to exceeding brittleness. Up to the present it is the variety of asbestos which is being used most, in the arts and manufacturing of the various articles which depend on the properties of asbestos for their fire-resisting and insulating qualities. Ninety-five per cent of the asbestos mined and used is chrysotile. Different varieties vary in their fusion temperature from 3,000 to 5,000 deg. F.

Chrysotile occurs as mass fiber, as slip fiber, and as cross fiber, but predominantly in the latter form. It is always associated with serpentine, and the veins in which it occurs always have walls of serpentine. The veins vary in width from a fraction of an inch to 18 in. Veins of the Canadian variety run every which way, whereas the veins of Arizona fiber are mostly horizontal and follow the bedding planes of the limestone in which they occur. In tensile strength chrysotile ranks second after crocidolite.

Chrysotile from Rhodesia is often called "Shabanie"—a trade name. Picrolite, on account of its brittleness, is of no commercial importance, though it is similar to chrysotile.

Arizona Asbestos

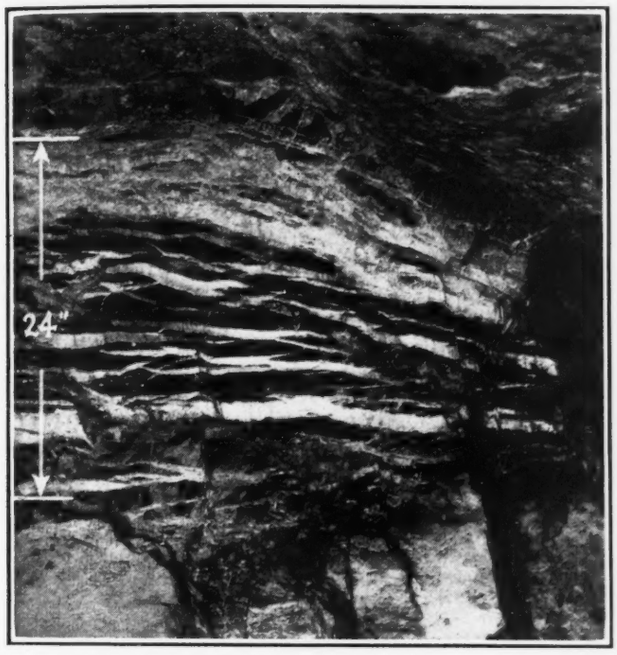
Gila County, Ariz., contains within its boundaries practically all of the chrysotile deposits of commercial importance found in Arizona. At present these are being worked to only a moderate extent, because they cannot compete with asbestos produced in Quebec, Canada, and South Africa, except for special purposes. The greatest single factor in the high cost of Arizona

asbestos is the item of transportation. The lower grades, which could be obtained by milling, cannot compete with those produced from Canada.

The cost of truck and rail transportation to markets, plus the low percentage of milling fiber, controls the situation except at such times when the demand is so great that No. 1 fiber will bring $600 and $800 and No. 2 fiber $400 or above.

The basic condition is the presence of diabase near the properly constituted limestone. Certain strata of the Mescal limestone (Cambrian) were evidently favorable for the necessary reactions when diabase was intruded and brought with it the solutions that created the chrysotile deposits.

In Arizona, asbestos is always found in the limestone



An occurrence of commercial asbestos ore in a Gila County mine

near the diabase. Failure to develop orebodies after finding the outcrops is to be attributed, in many cases, to lack of sufficient study of the condition while drifting or tunneling into the mountain-side. Only in exceptional cases will the ore be found to go straight into the hill. More often than not the ore channel will run off to the right or left. The reason for this may be found in the fact that the orebodies of chrysotile, in common with many other orebodies, have a long axis and a short one. Ore will be found to be more or less continuous along this long axis, allowance being made for the usual pinching and swelling of orebodies. The orebodies are found in the Mescal limestone along breaks and folds; breaks in the folds; and troughs or breaks in troughs. They were produced by solutions which came after the diabase. Troughs caused by gentle folding are especially favorable. Orebodies 50 or 60 ft. wide by 200 ft. long are exceptional. When they contain two workable horizontal serpentine and chrysotile vein zones 14 to 16 in. wide, which are close enough together to be worked from one tunnel, the most favorable condition of deposition is had.

The accompanying illustrations show how the ore occurs. Three to five ore horizons, one on top of the other, arranging themselves along vertical or nearly vertical breaks, are not uncommon, and orebodies pinching and swelling horizontally from one into another are frequent in well-mineralized areas.

A great deal has been written about the genesis of asbestos. Stephen Taber has reviewed most of the theories and has found them lacking in some particular, or altogether, in explaining the true birth of asbestos. His theory is quite sound and at least stands up when tested by comparison with the occurrences in the mines.

The solutions have certainly come up the breaks and have serpentinized the favorable or prepared beds of limestone. The serpentine then crystallized to chrysotile. Nowhere in Arizona has chrysotile been found except between walls of serpentine. By prepared beds of limestone are meant those beds that have had their layers partly opened by fracturing, as is done by crumpling the edges of a book. The passage of solutions is made easy by the openings thus made. Although it is not correct to speak of them as replacement deposits, in appearance asbestos deposits suggest this type, as the original limestone beds have been replaced by, or altered to, serpentine, and the extent of the alteration fades toward the edges of the orebody horizontally—that is, the mineralization is more intense and widest near the break along which the solutions have come up.

As the strong, long, soft fiber is the most desirable, it is most sought after. Often fiber which is hard and brittle is found adjacent to this soft variety without apparent reason. Of two parallel serpentine veins containing fiber, separated by a few inches of limestone, one may be of harsh and the other of soft fiber. Where exposed in the face the next round of 4 or 5 ft. may show a reversal of these conditions or both veins may contain either soft or harsh fiber.

If the price of asbestos is sufficient to stimulate production, Arizona can produce a fair tonnage of excellent fiber, as there are a number of good prospects and a few mines.

An asbestos stope. While the room is being mined out, a large part of the waste remains as filling and is held in place by dry walls, as shown here

Owing to the erratic occurrence of the orebodies in relation to one another, and to the erratic action of the diabase, it is not possible to plan underground trans-

portation or development work with the degree of nicety often observable in the mining of other ores. In general, once orebodies of sufficient size and in sufficient number have been indicated by prospecting, it is good practice to drive a tunnel under them in the diabase and then to run up raises from this level. This tunnel will serve the purpose of transportation and as an outlet for the waste and ore, and the raises from it will serve to prospect and will ventilate the mine workings. A valuable, almost indispensable, aid in the proper development of an asbestos mine in Arizona is an accurate geological and topographical map of the limestone and diabase areas at least.

Modified Room-and-Pillar Mining Employed

The mining method is simple, being a modified room-and-pillar method. Stulls are not often necessary, because the back is usually strong. While a room is being mined out, very much like a flat seam of coal, a large part of the waste remains as filling, which is held in place by dry walls built up about every 10 ft. The dry walls are not built to the roof, however. A space of 2 or 3 in. is always left between the top of the wall and the back, and on the top of this wall are placed pieces of old timber. The object of this timber is to act as an indicator with reference to the settling of the roof. As long as the piece of timber is movable the roof has not settled. If the roof pinches down on the board, settling is indicated and the necessary precautions to insure safety are in order.

Excess waste and mill rock are usually wheeled to the chutes designated for these materials. The first- and second-class ore is sorted underground. Cleanliness in the stopes is invaluable and necessary, so that properly graded and clean ore may be obtained and none wasted. All ore sorting is done in the stopes and is always on the basis of a given price per sack of 100 lb. The price varies with the ease or difficulty with which the ore is obtainable. It would be lower in the roomy, well-ventilated stope where the ore was easily obtained than in the stope where the ventilation was poor and the chutes for waste and mill ore were at a distance. The difference in the contract price between first and second class is arbitrarily fixed at 2c. per pound. When the difference in price was only 1c., practically all of the ore brought in was second class, the ore sorters not considering it economical to make the separation.

Patient Labor Required

The Mexicans are the best class of labor for this sort of work because of the care and patience necessary to produce "clean ore," which is the first essential of asbestos fiber. American miners have not the necessary patience nor viewpoint for this work; they were tried and found wanting. An American contractor was tried on development work in an orebody. He would not bother with the sorting of the ore; he wanted footage. The loss to the company was in proportion. A Mexican contractor, under the same conditions, would not make the same footage in a given period of time by about 25 per cent, but the per foot cost would be at least $2 less than that of the American. The Mexican repaid himself for the difference in the ore he saved.

Figuring the proper overhead and considering the need of ore at the time of the experiment, the results favored the Mexican contractor. The Mexican used less powder per foot because he drilled and blasted his round with due consideration for the presence of ore and his need of sorting it. The usual procedure was to shoot out the waste, clean it up, and then to blast down the ore with sufficient powder to break but not scatter it. With experience it was surprising how clean the ore was left when the waste was blasted away.

Leasers Operate in Restricted Area

Much of the development work was done by giving an ore sorter or lessee a piece of ground 6 or 8 ft. wide on the ore and the direction in which he was to mine. Many connections in ore between stopes and raises were made this way. Waste from the chutes leading out of the stopes was handled either by the lessees themselves or by company trammers. In the latter case the tramming cost was charged pro rata to the inmates of the stope. The last-named method was approved by the leasers because it gave them more time to sort ore, assuring a higher-grade product.

At specified times, twice a month, the ore was brought by burros to the warehouse, where it was inspected bag by bag. The bags were dumped down a chute 15 ft. long and 3 ft. wide on to an iron-topped platform by the side of which bag holders were conveniently placed. The ore was thus thoroughly inspected, and that which was unclean or too wet or otherwise undesirable was rejected. If the grade was harsh or brittle it was refused, but unclean ore, after being cleaned, was accepted. All ore that was passed was put into clean new bags, which were weighed, sewed up, properly labeled, and stored in their correct places. Credit slips for the number of bags were then taken to the office by the lessees and they were paid after deductions of advances, powder, caps, and fuse, which the lessees furnished themselves, had been made. To allow for the weight of the bag waste and moisture the scales were set at 105 lb. when weighing the bags as received from the miners.

Suggestions as to Lubrication

WIRE ROPES are properly lubricated during the process of manufacture. To obtain the best results, this should be followed at frequent and regular intervals by lubrication during the life of the rope, according to J. B. Richards, of the Hazard Manufacturing Co. Proper lubrication resists rust, corrosion, and the destructive influences of acids and mine water; minimizes external and internal frictional wear; prolongs the life and efficiency of the core; and enables the user to obtain the greatest possible effective service from his rope.

Wear of a running wire rope occurs where the outside wires come in contact with the sheaves and drums, especially if slippage takes place; and also where the wires come in contact with anything hard enough to chafe them. When a new wire rope is placed in service, the saturated fiber center gradually supplies lubrication to the wires and reduces the wear on them. As this center will not carry enough lubricant for the life of the rope, it is necessary to apply a lubricant frequently to the outside of the rope, which will be absorbed by the core. A mixture of a heavy-bodied lubricant, which must be free from acid, and a good grade of graphite is satisfactory. A viscous preparation which simply remains on the outside of the rope will not lubricate the inner wires, but a suitable lubricant will lubricate both surface and core.

DISCUSSION

Methods of Lowering Sticky Ores

THE EDITOR:

Sir—In your issue of Aug. 13 in his comments on my article which appeared in the *Engineering and Mining Journal* of June 25, Mr. Little, in comparing the costs of the two methods for lowering ore, has overlooked the following points:

1. That the pipe ore-pass saved the Comstock Merger Mines, Inc., a separate man and material shaft and heavy hoisting equipment.

2. That the United Comstock Co. had the heavy running gear for skip layout and a large shaft available, which he states was driven for a different purpose. However, his estimate of $9,000 to $10,000 seems low, as the United Comstock Co. warehouse accounts showed that the 7-ton skips and pneumatic ram landing gear cost $7,500, and I imagine that new winding and control equipment to handle the 7-ton skips would cost as much or more.

3. That the Merger's shaft made considerable water, which could not have been kept out of the loading pockets if it had not been for the concrete water seal, which would have been an impossibility if skips had been used. This is an important consideration, as the water would have made it almost impossible to handle the sticky ore.

If any cost comparisons are to be made, then Mr. Little should show what the United Comstock layout would have cost if the company had bought everything, and, furthermore, should include the cost of the shaft, and compare this with the Merger line to the 365-ft. level, as the distances are approximately the same in both cases. The latter cost approximately $6,600 installed, to which should be added only one-half of the cost of the shaft, as only half was used. Also, it is reasonable to expect that this line would have handled more than 250,000 tons, as it was 22 per cent shorter than the pipe line to the 237-ft. level.

Cost comparisons even when mines are adjoining are usually unfair to one or another. For instance, the skip installation served a mine which averaged over 1,300 tons per day during its life, whereas the pipe ore-pass did not handle more than 400 tons per day, although it could have handled several thousand. Therefore, the former had the advantage even if skips had been used in both cases. Among other things noted above, the pipe did save the Merger a hoist engineer per shift, which on the basis of 400 tons per day amounted to $0.045 per ton; on a 1,300-ton basis this would have amounted to $0.014 per ton.

Furthermore, it is not fair to consider the replacement cost of the first ore-pass, as the pipe was neither properly cast nor installed to best advantage. It was really nothing but an experiment, owing to an absolute lack of data, and should only be considered as such.

Mr. Little makes the statement, "Considering the upkeep cost of bulkheads, and time lost and dangers incurred in working gravity pass, there are many situations where skips might be more economical." The only bulkhead was a light concrete water seal at the bottom of the shaft. This was never damaged, as there are no rock spills with a pipe ore-pass. On the other hand, we had to repair the lower part of the skip shaft as a result of spills. The cost of this repair work was charged to Timbering and not to Hoisting, and therefore does not appear in the costs given. Although the cage operated in the adjoining compartment, there were no accidents as a result of the pipe ore-pass, whereas a man was killed in the skip shaft during the Merger's operation. From a safety standpoint the pipe ore-pass has a decided advantage over skips. Also no time was lost after the pipe lines were properly installed, which can hardly be equaled in any skip installation.

The second line to the 237-ft. level and the line to the 365-ft. level gave no trouble whatever; they required no attendance, so there were no operating charges unless two men on the grizzlies (one man at each level) should be considered as such.

Mr. Little suggests that rubber-lined wrought-steel pipe might be worthy of thought. This was considered but rejected on account of the high initial cost, which was even greater than solid rubber pipe.

The United Comstock skip plant had not worn out when operations ceased, but it was not worth salvaging on account of the extreme weight of the equipment, inaccessibility, and lack of any market for such unusual equipment. On the other hand, cast-iron or manganese steel pipe would have a salvage value wherever a foundry is close by, as the short lengths of pipe can be removed very easily.

There was no intention on my part to make any broad claims for the scheme. It did work remarkably well at the Comstock after the first troubles had been ironed out, but the experience was not conclusive by any means. However, the results did indicate a useful field, particularly where the cost and time lost in relining timbered ore passes is an important consideration. The United Comstock layout was a happy solution of a difficult problem and proved satisfactory. However, it cannot be compared with the pipe ore-pass, as conditions governing the two layouts were very different.

Fresnillo, Zacatecas. THOMAS C. BAKER.
July 21, 1927.

[In commenting on the above letter of Mr. Baker's, Mr. Little states that his own comment was merely to bring out the point that under the circumstances obtaining at the time the skip installation was made, the installation was not unduly expensive, and also to give comparative data on the two methods of ore handling. Mr. Little still believes that his recollection of the cost of the skip plant was substantially correct.—EDITOR]

Standardized Drill Round at Newmarket, Tennessee

THE EDITOR:

Sir—An article under the above heading appeared in the July 16, 1927, issue of *E.&M.J.* This article brought back memories to me. I used this identical cut and drill round twenty-three years ago in the conglomerate lodes of the copper district of Michigan. It was originally devised by a Cornish miner, I understand, about forty-five years ago, and has been used more or less continuously since, particularly in driving on narrow veins, where it is imperative to carry narrow drift headings, say three or four feet wide. It has been used also, as I have indicated above, in copper mines where considerable native copper is present and where, as a consequence, it is difficult to pull a cut of over five feet in a 6-ft. x 7-ft. drift.

About twenty years ago I introduced and tried out this same cut in the copper mines of the Tennessee Copper Co. at Ducktown, Tenn. As compared with the four-hole or pyramid cut then in use there, it was found to be less economical both in the number of holes and consumption of explosives. Ignition of the massive sulphide in the Ducktown mines by the use of the burn-out cut was another disadvantage in that particular instance.

My experience in hard-rock mines indicates that usually a four-hole pyramid cut, in which the holes have been properly placed and spaced, will result in squaring a heading up to eight feet advance per round in a 6-ft. x 7-ft. drift.

WILL HATTAM,
Mine Superintendent,
Silver Dyke Mining Co.

Neihart, Mont.

* * * *

A Plea for the Asbestos Producer

THE EDITOR:

Sir—Your editorial on the manganese situation in the issue of July 30 indicates that the sometimes unfortunate mine owner at last has a sympathetic advocate in *Engineering and Mining Journal*—an advocate who is not awed by the "distinguished gentlemen" who represent capital before the Tariff Commission and explain why the manganese mine owners are not entitled to protection. The latter seldom appear at such hearings, as they cannot afford the expense, and for the same reason cannot hire a competent representative. Your new policy should put courage into the heart of the manganese mine owner who is trying to make an honest living and at the same time develop a natural resource.

I wish to call your attention, however, to the fact that all the nice things you say about manganese are also applicable to the asbestos situation. We have in this country large deposits of asbestos of superior quality, and although the United States is the largest consumer in the world, our own mines are forced to lie idle because there is no tariff against the more cheaply produced foreign product which now enters this country free of duty. The "distinguished gentlemen" previously referred to have been very successful in spreading propaganda to the effect that it is the duty of our government to discourage any development of our reserves of asbestos, another vital necessity in time of war, lest in a time of emergency we be found with exhausted mines. This propaganda has apparently influenced the departments at Washington to believe that our resources of asbestos are limited or that the quality is inferior or that the occurrences are in inaccessible areas. This is false, of course, and is inspired by the fact that large amounts of American capital are profitably invested in Russia, Africa, and Canada, where labor and transportation are cheap.

It would seem that the present is a good time for the asbestos producers to form an association and take steps to counteract the effects of the purely selfish campaign of protection to American investments in foreign countries at the expense of the American pioneer in the development of our domestic natural resources. The reasonable protection of the latter means revenue to our government and employment to American labor, while at the same time it develops industries of vital importance in case of a war and which as you truthfully say "could no more be developed overnight than a million men could be made to spring to arms."

R. MORRISON, JR.

New York.

* * * *

Platinum and Its Outlook

THE EDITOR:

Sir—All those who are interested in platinum justly ask themselves, "What are the prospects of the present platinum market?" For three or four years previous to last spring the price of platinum kept fairly steady, and to invest in platinum was more a financial question than a speculative one. Today to invest in platinum is a speculative question, pure and simple, because no one knows what will become of the platinum market.

It is true the Russian government, through its authorized channels, gives assurance that platinum will maintain its present prices for an indefinite period and thereby it hopes to regain its pre-war monopoly. Moreover, by maintaining the present scale of prices the Russians believe they can extend its use.

As far as extension of the use of platinum is concerned, there are no signs as yet. The chemical industry is not yet attracted by the present price of platinum, beyond its ordinary needs. The dental industry continues to use no more and no less than it did for the last ten years, and the white-gold manufacturers so far have shown no inclination to return to platinum.

What is the cause? Colombia and South Africa and the various other sources of supply have not discontinued production of platinum, and it is not to be expected that they will. It is possibly true that the Russians may command cheaper labor, but the technical improvements are equally available to all countries.

It is to be hoped that in the present struggle between Russian platinum producers and those of non-Russian origin, the ultimate outcome will be the establishment of true facts, both as regards real production costs and with respect to the possibilities of legitimate expansion in the use of platinum in the industries. When these facts are established, it will be easy to ascertain what the real price of platinum should be, so that the platinum business is again on a basis which is stable and not speculative only. It is believed it will then lend itself once more on an attractive basis to science and advancement, thus forming a solid foundation for investment.

It is not so much a question of how high or how low the price of platinum should be—it is a question of what are the legitimate prospects of this metal. No doubt in the not too distant future the correct answer will be given.

OBSERVER.

New York City.

Marcus Daly, and Anaconda's First Scrap-Iron Precipitation Plant

THE EDITOR:

Sir—The picture of the Anaconda scrap-iron precipitating plant at Butte, Mont., on the front page of the *E. & M. J.* of July 16 brings to mind the beginnings of that feature of copper mining in Butte and also a bit of the personal history of the late Marcus Daly, who was so closely associated with the early history of the camp.

When I was employed by Mr. Daly in 1892 to reconstruct the converting plant at Anaconda, I was shown through the Anaconda mine, and precipitation of the copper from the mine waters had not been started. In the following year a lease was given to some man whose name I have forgotten, and this leaser built tanks and used scrap iron of all kinds to precipitate the small amount of copper that was then dissolved in the mine water.

There had been a fire in the Anaconda mine two or three years before in which there was some loss of life, and to put the fire out the mine was flooded up to the collar of the shaft. When the water was pumped out the sulphide ore was still so hot that it soon started to burn again, and the sulphur dioxide gas made working in the mine disagreeable, so that part of the mine in which the fire was localized was bulkheaded off. Owing to the settlement of the walls it was impossible to prevent the sulphur dioxide from penetrating the workings, and Daly or one of his employees suggested that the fire could be extinguished by putting down drill holes from the surface and running water down through these drill holes into the burning area, an idea which was subsequently carried out.

The burning of the ore had caused the formation of a lot of sulphates which only needed water to go into solution and at once the mine water became a blue solution of copper sulphate. The leaser on the mine water at the surface could not build tanks and buy scrap iron fast enough and he was making money so fast that it aroused Daly's ire. The leaser with his new wealth bought a large yellow diamond for his shirt front and one for each hand, bought a few race horses and generally began to sow a large crop of wild oats. While his lease lasted nothing could be done apparently and Daly was as mad as a wet hen.

One Sunday while I was in Butte I looked over the situation and learned that not only was there a terrible loss of copper but that the mine pumps, the pump columns, the the mine rails and spikes were being destroyed by the acid waters. Well, they stopped the flooding with water from the surface after it had caused great damage to the mine equipment and a great number of sores on the skin of the miners where the hot acid solution had dropped. This did not stop the acid solutions going to the pumps, and the leaser continued to sow wild oats. In conversation Mr. Daly expressed himself very forcibly on the subject of the aforesaid wild oats, yellow diamonds, race horses, etc., and his irritation was further increased by the fact that one of the leaser's plugs beat one of Daly's horses. Daly remarked that he (the leaser) "had a racing stable, and that's expensive, I know that."

I suggested that the trouble with the pumps and pump columns might be much reduced by putting scrap iron in the sump in the mine and also enlarging the sump so that the copper would be precipitated before the water entered the pumps. This seemed to appeal to Daly's imagination, and it was done; but after I had gone to seek my fortune elsewhere I read in the mining news that the leaser had secured a judgment for damages to the extent of $50,000 for violation of contract by the introduction of scrap iron into the mine water before it reached the surface.

There were many interesting stories regarding Mr. Daly, who was somewhat distrustful as a friend, and when it came to his enemies it was simply a question of whose steam roller was the more powerful. When Montana was admitted as a state there was an election held to determine where the capital should be situated. Anaconda for the capital was Daly's choice and that of all those who were employed by the Anaconda company and all others that he could influence either by past favors or promises of favors to come.

After the dust cleared away and Helena was made the capital by popular choice, the people to whom Daly had made promises came in droves to seek their reward, and they did not meet with a warm welcome. I was standing at the entrance of the Montana Hotel, in Anaconda, about a week after the election and saw Mr. Daly coming across the street. As he made his way toward the hotel he was accosted several times by men who were waiting for him, and after a few short words he would advance and be tackled by another and another. When he passed me at the entrance to the hotel he looked irritated and harassed, and seeing me with an understanding look in my eye he said, "They haunt me! They haunt me! They are like damned ghosts!"

Biarritz, France. H. W. HIXON.
July 30, 1927.

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Mining Engineers Favor Manganese Tariff

THE EDITOR:

Sir—Not as a manganese producer but as a consulting mining engineer frequently serving the producers of manganese, I wish to thank you for coming out in favor of the tariff. Many years' experience in my profession place me in a position to realize the abundant supply of high-grade manganese ore in Virginia as well as the various grades of ore in other portions of the United States.

Some idea of the ore reserves of Virginia can be formed by comparing the production of the famous Crimora Mine with the production of other states. Up to a few years ago the production of this mine was greater than the combined production of all the other manganese mines in the United States. I feel absolutely safe in saying that Virginia has a number of undeveloped deposits as good as Crimora.

With the assurance of a protective tariff for a period of years, I am sure that the deposits of all grades of ore in Virginia could be developed to the point of supplying the steel industry for a long time to come. Another important point is that the low-grade materials can be treated and concentrated so that when they leave the mine they will be high-grade ores.

I am firmly of the opinion that the anti-tariff side cannot "hoodoo" our tariff commission to believe that we do not have a good supply of manganese for domestic use. MARSHALL HANEY,

Geer, Va., Aug. 8. Consulting Mining Engineer.

NEWS OF THE WEEK

Summary

SCOPE of forthcoming bulletin of the Bureau of Mines on geophysical methods of prospecting is described by Dr. J. E. Spurr, who is acting as a consultant to the Bureau in this work.

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Attorneys of Charles Butters bring suit to recover $4,828, representing a bullion shipment from the San Albino mine, in Nicaragua, during the time it was held under seizure by General Sandino.

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Slides of tailings cause five fatal accidents during 1927 in the Joplin-Miami district. Fatal accident rate for workers at retreatment plants greatly exceeds that for miners.

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Minerals Separation, Ltd., publishes results of flotation tests on platiniferous sulphide ore from the Middelburg district of the Transvaal, South Africa.

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Japanese firm of Mitsui is stated to be in negotiation with Soviet Russia for a platinum concession in the Urals for a period of twenty-four years.

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State of Minnesota Supreme Court rules that lessees pay taxes on royalties when covenant of lease provides that lessees pay all taxes.

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Quincy mine, in the Michigan copper district, resumes operations. U. S. Bureau of Mines car leaves for Duluth.

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A consolidation of the Premier, B. C. Silver, and Sebakwe holdings in British Columbia appears probable.

* * *

Continued drop in price of silver and unfavorable prices for lead cause more properties in Mexico to close.

In Canada With the British Empire Mining Congress

By A. B. Parsons
Associate Editor

MONTREAL, AUG. 22.—A tribute from and a challenge to researchers in the technology of the mining and mineral industries, and particularly of metallurgy, voiced by Sir Thomas Horne, G.B.E., K.C., M.P., was the outstanding feature of the opening session of the Second Triennial Empire Mining and Metallurgical Congress here today. The keynote of the Congress is the development and expansion of the mining industries throughout the empire, thereby to attain as nearly as possible economic independence in the matter of mineral and metal supply; to improve the industrial status of each of the constituent countries; and to render the empire stronger in time of war and more prosperous in time of peace. Sir Thomas, who is Honorary President of the Congress and Secretary of the Board of Trade in the Baldwin government, made it clear that in his opinion no other group of workers had it in their power to do so much to advance these causes as the mining and metallurgical engineers, represented in the audience of 400 gathered from all parts of the globe. He stressed also the point that aside from the advantages accruing to the empire, every discovery and advance in the arts of exploiting and beneficiating ores was a contribution to the progress of mankind. His was an excellent speech, eloquently delivered.

MANY COUNTRIES REPRESENTED

Nothing just like this convention probably ever has happened before in the mining world. Other gatherings may have been as large, but they did not compare with this in the number of countries represented, the long distances traveled, and the extent of the tours offered. Besides visiting members from the various constituent organizations, ten in number, official delegates from many countries are present. The names on the registration list represent: Germany, Belgium, France, Russia, Korea, Tanganyika, Federated Malay States, South Africa, Rhodesia, India, Australia, Burma, the Gold Coast and the United States. Among those from the United States are: R. M. Catlin and Mrs. Catlin, H. Foster Bain and Mrs. Bain, G. A. Chapman, Louis D. Huntoon, F. W. Foote, William H. Utz, James H. Robins and Mrs. Robins, C. W. Mowat, Charles P. Perin and Mrs. Perin, R. C. Warriner and Mrs. Warriner, James Wilding and Mrs. Wilding, Robert K. Warner and Mrs. Warner, A. Norman Into, and A. B. Parsons, all of New York; F. Lynwood Garrison, Walter Wood, and Mrs. Wood, of Philadelphia; Robert H. Irons and Mrs. Irons, of Harrisburg, Pa.; Scott Turner, of Washington, D. C.; Theodore Marvin, of Wilmington, Del.; Irving M. Marshall, of Urbana, Ill.; and Philip N. Moore and Mrs. Moore, of St. Louis.

More than 400 already had registered today, of whom upward of one hundred were ladies. A large number of additional names will be put on the roll at Toronto and at other points as the Congress moves westward.

GOLF RECEIVES CONSIDERATION

Most of the visitors from overseas arrived on the official ship, R.M.S. *Alaunia*, which docked at 7 o'clock this morning, instead of last evening, as was expected. Incoming trains reached Montreal at about the same time, with the consequence that what must have been 1,000 pieces of baggage were landed simultaneously in the lobby of the Windsor Hotel. Incidentally, the number of bags of golf clubs in the collection suggested that the occasion might be in international golf tournament rather than a congress of mining engineers. Indeed no attempt is made to conceal the fact that a good time is one of the purposes of the individual visitors, even if the collective aim is to help aggrandize the mining industry of the empire. The golf clubs are symbolic.

To the credit of George C. Mackenzie, general secretary, and his staff it may be said that they handled the crowd not only with efficiency but with courtesy.

ENTRAIN FOR TOURS

Tomorrow morning a technical session will be held; in the afternoon an option between sightseeing and golf will be offered; in the evening will be the official banquet; and at 11:55 the Congress will entrain for the journey westward via Ottawa and Toronto toward the marvelous storehouses of nickel, gold, copper, and silver in northern Ontario and Quebec.

Quincy Mine, in Michigan Copper District, Resumes

Mohawk to Break Production Record—Future of Seneca Undetermined—C. & H. Sells Timber

WORK has been resumed in the Quincy mine, in the Michigan copper district, after a shutdown since July 13 caused by fire in No. 2 shaft. Hoisting has been started in No. 6 shaft, and timbermen are at work in No. 2. Three shifts of timbermen will be employed, and repair work probably will take several months. The fire damage in No. 2 is above the 53 level. It will be possible to work three or four levels above the 86 in No. 2 through No. 6 shaft. The U. S. Bureau of Mines car, which has been at the mine since the outbreak of the fire, has left for Duluth, the work of its engineers having been completed. Quincy has lost one month's full production on account of the fire, and output during the remainder of the year will be considerably curtailed owing to the necessity of extensive repairs in No. 2 shaft. The Mohawk mine will break all records for production this year, as a result of the continued richness of No. 6 shaft and cost reductions. There has been no slackening of output, as usually is the case in mid-summer, labor having been plentiful. July production was on a par with that of June; August production likewise will make a better showing than this month last year.

Concrete mineral bins are being constructed in the stamp mill at Gay, completion of which will wind up Mohawk's program of construction. The mill has been thoroughly modernized in all departments and is operating at top efficiency. Regrinding units and improvements in the wash department have added more than a pound of refined copper to recovery.

Reliable information is not yet available in the Michigan copper district as to the future course at the Seneca mine, which was shut down on account of lack of funds. In his summary of the Michigan copper properties, submitted before Seneca closed, L. P. Barrett, state appraiser of mines, referred to Seneca as follows: "The Seneca Copper Mining Co. has not yet demonstrated that it will ever be a profitable independent mine. Combined with the adjoining Mohawk, the resulting saving in overhead would prolong the reserves of the Mohawk mine and insure in all probability a longer period of profitable copper mining for this part of the Kearsarge lode than can be hoped for by the separate operation of either unit. For this reason, Seneca has a value to the Mohawk."

Calumet & Hecla Consolidated has sold its standing timber in Houghton and Keweenaw counties to the Stearns-Culver Lumber Co., of Ludington, Mich., for $350,000 cash. The timber is on lands covering 31,134 acres, and according to the terms of the contract must be removed by Nov. 24, 1944. Cruisers spent several months estimating the stumpage.

Increased Control of Bauxite Rumored

ACCORDING to information from reliable sources, the Aluminum Company of America has purchased an interest in the Bauxit Trust A. G. of Zurich, which, through its subsidiaries, controls the Hungarian bauxite deposits constituting the current source of supply of the mineral for Germany. The move is interpreted to represent either another step on the part of the Aluminum Company of America toward control of the world's bauxite, or a plan of the company to force up the price of German aluminum.

Minnesota Increases Tax Burden of Operators

In a prolonged test suit brought by the Marble family against the Oliver Iron Mining Co. the Minnesota Supreme Court has rendered a decision that despite the Legislature's intent to tax royalty received by owners of ore lands, the lessees must pay this tax when a covenant in the lease explicitly provides that lessees pay all taxes. This reverses the decision made in the district court that owners of land should bear this tax, and adds a double tax burden to the operator, who is burdened at present almost to the point of confiscation of his property.

Slides of Tailings Cause Five Deaths in 1927

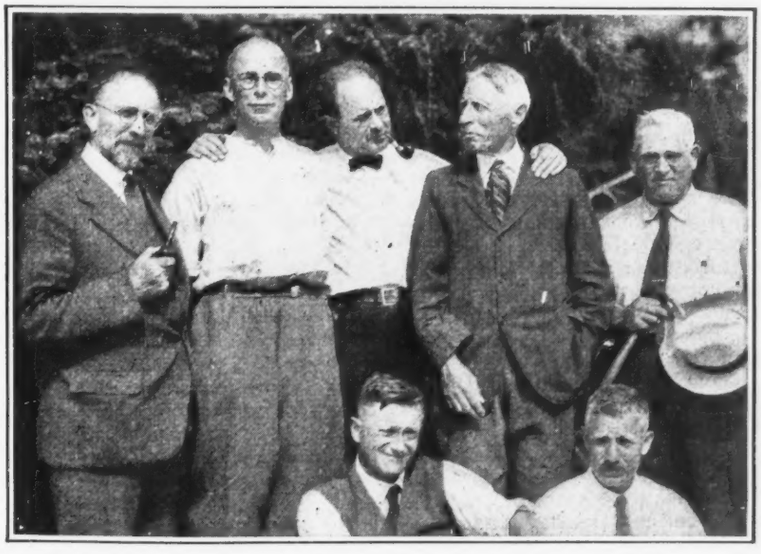
In the Joplin-Miami District—Fatal Accident Rate for Workers at Re-treatment Plants High

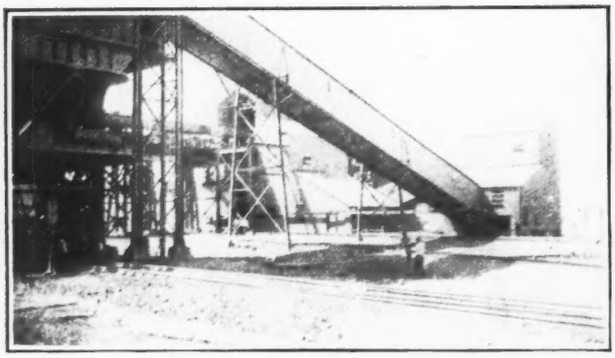
THOSE interested in accident-prevention work in the Joplin-Miami district are being forced to give special consideration to the problem of the safest way to work tailing piles. Since Jan. 1, 1927, there already have been five fatal accidents resulting from slides of tailings. The problem was discussed at a special meeting of the safety engineers of the district at a meeting recently held at Picher, Okla. It was brought out that there were no accidents incident to the re-treatment of tailings during 1925 and 1926. About the latter part of 1926, however, a sudden growth in the re-treatment of tailings occurred, as a result of the good profits reported from some concerns. With the increased activity came several fatal accidents. According to Riley Clark, deputy state mine inspector for Oklahoma, one man out of each forty-five employed at tailing plants has been killed, whereas the ordinary fatal accident rate in regular mining operations is three out of one thousand.

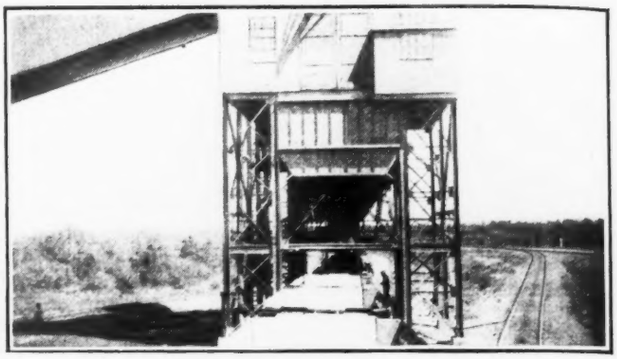
F. W. Evans is preparing to build a new mill on the site of the Empire mill, in the Kansas section of the district, which was recently destroyed by fire. The loss came just after a new shaft had been completed on the property and a good body of ore opened up. The new mill will be larger and better equipped than the one burned.

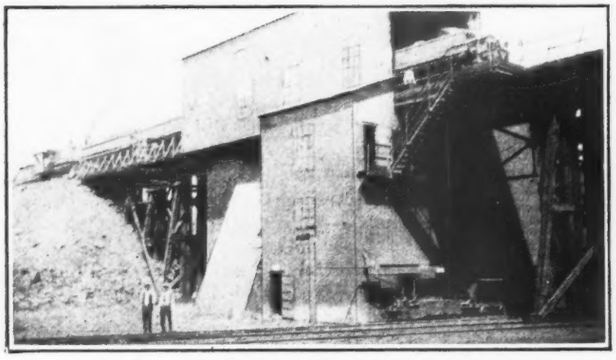
A group of eminent geologists on a field trip across Canada

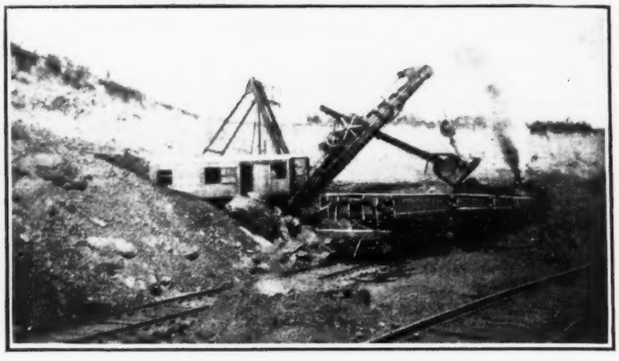
Left to right: Standing, the Rev. R. Connell, vice-president of the Victoria Natural History Society, Victoria, B. C.; Dr. E. B. Bailey, Scottish Geological Survey, Edinburgh; Prof. R. M. Field, geological department, Princeton University; Thomas Golby, Victoria, B. C.; Prof. W. L. Porter, head of the geology department, Davidson College, Davidson, N. C. Seated: Prof. L. W. Collet, of the University of Geneva, Switzerland; H. T. Nation, Victoria, B. C., of the British Columbia Bureau of Mines. Professor Collet is one of the best known alpinists in Europe and is an authority on structures.











Above—Conveyor from mill to loading pocket
Below—Mine cars being dumped at mill

Above—Loading cars with concentrates
Below—Corsica open pit mine

Corsica Mine Plant

Corsica Plant Uses Improved Practice in Beneficiating Iron Ores

Installation of Modern Equipment Reduces Cost of Construction and Operation Expense at Concentrator of Pickands, Mather & Co.—Mill Force of Six Men Supplants Crew of Fourteen

THE progress made in ore dressing during the last seven years, particularly in the beneficiation of iron ore, is clearly demonstrated by a comparison of the Corsica mine plant, built in 1926 by Pickands, Mather & Co. at Elcor, Minn., with those plants built on the west end of the Mesabi range prior to 1920. In the older installations on the western section of the range the standard equipment for a one-unit plant—that is one that would wash 2,000 tons of concentrates in ten hours—consisted of: One 6 ft. by 12 ft. trommel screen; two 25 ft. log washers; four 18 ft. log washers, called "Turbos"; and about twenty Deister Overstrom tables. The motor horsepower required to drive this equipment averaged 140 hp. and the water needed for washing was about 2,000 gal. per minute. A mill force of three men at least was required with this equipment. At the Corsica plant all of these machines are combined into one, driven with a 40 hp. motor and attended by one man, who also has time to take care of a duplicate machine, if it is needed. The approximate amount of water required for washing purposes amounts to only 1,000 gal. per minute. The space taken by this machine is one-third that needed for the old equipment. This factor has resulted in cheaper requirements in mill-building construction.

The Corsica plant, in addition to washing ore, is also equipped for crushing and screening. Equipment used for this work includes: One Barr chain grizzly; two 5 ft. wide by 10 ft. long apron feeders, with belt conveyor feeders below them; three 36 in. wide belt conveyors driven by one 5-hp., one 50-hp., and one 75-hp. motors; and one 10 in. gyratory crusher, driven by a 100-hp. motor.

In the mine pit most of the crude ore is loaded into 20 cu.yd. air-dump cars with a model 125 Marion electric shovel equipped with a 35 ft. boom and a 4 cu.-yd. dipper.

The plant started in 1926, and has been very satisfactory. The crude ore averages 22 per cent silica, and is washed to 6 per cent silica. When operating for crushing and screening six men are needed, but when washing is included in the operation, eight men are required, including the foremen. This compares with a force of about fourteen men in the old plants of the same capacity.

The accompanying photographs show: A general view of the plant; the receiving pocket where crude ore is dumped from the 20-cu.yd. cars; the pocket where concentrates are loaded into railroad cars; and the open-mine pit with an electric shovel loading a train. The mine contains about 4,000,000 tons, and the average yearly production of concentrates is approximately 400,000 tons. All power is purchased from the Minnesota Power and Light Co.

Large Iron and Steel Plant Planned at Guadalajara

Development of a large deposit of iron ore situated south of Guadalajara, Mexico, adjacent to the new extension of the Southern Pacific Railroad of Mexico, will be started soon by Pablo Saenz and associates. They contemplate the construction of a large iron and steel plant at Guadalajara, Mr. Saenz said. Belgian interests are associated with him in the enterprise.

Washington Letter

By Paul Wooton
Special Correspondent

J. E. Spurr Describes Scope of Forthcoming Bulletin on Geophysical Methods

Washington, Aug. 20—The scope of the forthcoming bulletin of the U. S. Bureau of Mines dealing with the principles involved in geophysical methods of prospecting is given in the following statement by Dr. J. E. Spurr, who is acting as a consultant of the Bureau in connection with this work:

"The great interest in geophysical methods of prospecting for ores, oil, and other geological features has not been accompanied by a clear conception, on the part of the mining engineer, geologist, and miner, of the problems, the progress, the limitations, the specific applications, or the difference in the methods employed. For this reason the first publication of the Bureau of Mines on the subject is to be devoted to an A-B-C exposition of the various methods which have been used or proposed, and the underlying scientific principles in each case. These explanations are given in the fewest possible words, in the barest outline, without unnecessary terminology or detail. This in itself is a marked literary achievement for physicists of high standing like the authors. Therefore by perusing this pamphlet one can obtain—in the case of most readers for the first time—an idea of what is being done, and why.

"The success or failure in geophysical prospecting depends specifically not only upon the geophysical method and its application, but upon the geological conditions, and the interpretation of the physical data by the geologist. There have certainly been some striking positive results already obtained; and also there have been a great many negative experiments—the latter, so far, probably considerably outnumbering the former. As to specific application, the present pamphlet is wisely, and indeed necessarily, non-committal. Nor do the writers commit themselves notably as to the relative value of the different methods—a subject which it would be difficult to discuss thoroughly in the present state of our knowledge.

"The description of methods is grouped under the four chief heads—magnetic methods, gravitational methods, electrical methods, and seismic methods; and the terse descriptions are well illustrated with diagrams, twenty-seven in all.

"This preliminary statement of principles will logically be followed by the investigation of specific methods under specific conditions, the publication of the results by the Bureau, and the gradual co-ordination of cases into broader and broader groups. Such knowledge should increase immeasurably positive results, and decrease proportionately unnecessary failures."

It has been announced that forty-nine first-aid teams and nineteen mine rescue teams have entered for the sixth international first-aid and mine rescue contest which begins Aug. 23 in Pittsburgh. This makes the entry list a little larger than was the case last year at San Francisco. Being in the East, most of the teams represent coal mines, whereas the contrary was the case at San Francisco. In fact, all of the teams entered with the exception of five are composed of employees of coal-mining organizations. Practically every mining state in the Union is represented by safety specialists who act as lay judges of the contest. The teams entered represent thirty-four states.

Hotchkiss, Blue & Co., of Chicago, were the low bidders for the new mine rescue car which will replace old car No. 3. The successful bid was $44,200. The new car, which will be delivered before the end of the year, will be assigned to Pennsylvania.

THE drill in potash well No. 4 being put down by the U. S. Bureau of Mines at a point near Metz, Ector County, Tex., reached the salt bed at a depth of 930 ft. A churn drill was used to that depth. Casing now is being set, and a core drill will be used through the salt bed. Well No. 3, in New Mexico, has attained a depth of 900 ft. Salt in irregular patches was encountered at depths from 360 ft. to 440 ft., when the drill entered solid salt.

Abandonment of that part of the main line of the Hancock & Calumet Railroad Co. between Calumet and Kearsarge, in Houghton County, Mich., has been authorized by the Interstate Commerce Commission. The mileage to be abandoned was built in 1887 by the Hancock & Calumet, as a part of its main line to transport copper rock to the stamp mills on Torch Lake. Kearsarge, which is a mining community with a population of 1,500, is served also by the Copper Range railroad and the Houghton County Traction Co. The Calumet & Hecla Consolidated Copper Co. has built a private railroad from its Ahmeek mine to the stamp mills on Torch Lake. The new line now handles 95 per cent of the traffic formerly shipped over the line to be abandoned.

The Bunker Hill & Sullivan Mining & Concentrating Co., of Kellogg, Idaho, has applied to the Federal Power Commission for license covering a small project in Deadwood River in Valley County, Idaho. It is proposed to construct a dam 124 ft. long which will develop 320 hp. of primary power. The power is to be used in connection with the company's milling operation. The Southern Sierras Power Co., of Riverside, Calif., has applied for a license covering a 20-mile transmission line in San Bernardino and Kern counties, Calif. The line is to carry a power supply for mining operations of the Pacific Coast Borax Co.

London Letter

By W. A. Doman
Special Correspondent

Mitsui Negotiating for Platinum Concession in Soviet Russia

London, Aug. 9—It is stated that the Japanese firm of Mitsui is in negotiation with the Soviet government for a platinum concession in the Urals for a period of twenty-four years. The Soviet government will have an interest in the sale of the metal on the Japanese market.

There seems to be a possibility of Cyprus coming to the front as a copper producer. In 1921 a report upon the copper deposits was made by the British government and mineralization was found to be widely distributed. A prospecting permit has been granted by the governor to G. C. Palvides. The concession covers two square miles in the Limasol district.

The August bank holiday seriously interfered with business in mining shares. While the public is enjoying itself, and directors of many companies are absent from town, the Stock Exchange finds little to do. At this season of the year, too, news likely to create excitement does not come forward readily from the mines. Perhaps there is not much to come. There are two exceptions—the Sub Nigel, on the Far East Rand, and West Rand Consolidated. The former has recalculated its ore reserves as at June 30, and gives an estimate of 1,013,000 tons, of an average value of 20 dwt. over a stoping width of 25 in., equivalent to 500 in.-dwt. This compares with 731,000 tons, at 17.5 dwt. over 28 in. at June 30, 1926, and 825,000 tons at 22 dwt. over 23 inches at the end of December last.

IN CONNECTION with this it is suggested in certain quarters that working arrangements may be arrived at between the Sub Nigel and the Lake Proprietary Mines. The last named company owns a property in the same district and is under the control of Sir Abe Bailey.

As regards West Rand Consolidated Mines, an official cable has now been received dealing with developments from the west shaft at the 20 and 22 levels. For 155 ft. driven in the west drive beyond the water fissure on the upper level the average value is 12.40 dwt. over 37 in. channel width. On the 22 level cast drive, the reef encountered east of the dike for 125 ft. driven has a value of 37.50 dwt. over 22 in. channel width. These workings are on the main reef, and it seems probable that the tonnage developed during the current year will considerably exceed that for 1926. For the first half of 1927 development shows an average payability of 45 per cent, compared with 40 per cent for the whole of last year.

Mexico City Letter

By W. L. Vail
Special Correspondent

More Silver Properties Close—Government Aid Improbable

Mexico City, Aug. 15—The situation of the silver mine operators in Mexico is growing daily more difficult because of the continued drop in price of silver and the unfavorable prices on lead, according to recent reports. Conditions are aggravated by the inability of the government and financial institutions to hold up the silver peso, despite considerable "artificial respiration." Most of the expenses of mining are met with the peso. The ability of the government to present a satisfactory solution at the present time is doubted and further closing of important properties during the next sixty days is expected.

The Secretary of the Treasury has issued an order annulling the recent decree changing the system of weights on metals and bullion for export. This order releases for shipment at Tampico a considerable quantity of ore that has been tied up there for several weeks. Under the latest order of the Treasury Department the certificates of the official federal assay office at the point of embarkation of ores or bullion is accepted on carload lots or bars. The differences arose between the shippers and port authorities at Tampico over the method of weights to be employed, the port officials not accepting the old methods of the official assayers. As a consequence several carloads of metal were detained, the shippers retaliating by routing later shipments by rail to Larado, Eagle Pass, and Juarez. Finally the business men at Tampico took a hand in the matter, with the results as mentioned.

NOTWITHSTANDING the fact that the time limit for registering old mining titles expired on July 31, the Secretary of Commerce, Industry, and Labor has sent out a communication stating that a hard and fast rule will not be applied in cases where mine owners show a reasonable diligence or can present plausible excuses for failure to comply with the decree. "It is not the intention," states the Secretary, "to work hardship on bona fide operators or holders of titles." Apparently the department wishes to cure some mine owners of their sluggish habits.

Governor Abelardo L. Roderiguez, of the northern district of Lower California, makes some severe criticisms based on the alleged misrepresentations of certain mine owners in his territory in their attempt to attract labor to their camps. He threatens to take official action to put an end to what he terms iniquitous abuses.

The Bradbury interests, in control of the Bolanos district, Jalisco, are increasing development work on all the properties there with the intention of installing a treatment plant during the coming year. Power equipment was recently purchased and is now en route to the property. The nearest point of access to the Bolanos district now is via the city of Zacatecas. Work on the property was interrupted for a few weeks during the recent revolutionary attempts in Jalisco, but now everything is reported as being normal. M. K. Campbell succeeds J. C. Feely as superintendent.

Permission has been granted the Mexican Mining Co. of Chihuahua by federal authorities to discharge a considerable number of workmen. The officials of the company showed that exploitation of the property at the present time is unprofitable. The question of recompense for the discharged men is now under consideration, and it is presumed they will be allowed two weeks' pay.

A cable tramway is being constructed by the Republican Milling & Mining Co. from its mines at Wadley, San Luis Potosi, to the foot of the mountain. The Mexico City offices of the company were closed in July, and the company should be addressed at Wadley, San Luis Potosi. Charles L. Bradley is general manager of mines during the absence of F. H. Sharpe, who is now in England. Exploration work at Pacheco, Queretaro, has been temporarily suspended.

What is advertised by the local press of Chihuahua as an important deposit of opal rock has been discovered in the Batopilas district, northwest of the city of Chihuahua.

The Hearst properties at Tayortita, Durango, are reported to be in high-grade ore.

The Peñoles lead smelter at Monterey is reported to be operating again. The company is pushing operations at its Calabaza mine in Jalisco.

Suit to Recover Bullion From San Albino Mine

Raids of General Sandino on the San Albino gold mine, in Nicaragua, under the control of Charles Butters, are disclosed in a recent suit filed by attorneys of Charles Butters against the Wells Fargo Bank and Union Trust Co. of San Francisco by which they seek to recover $4,828, representing a bullion shipment believed to have been taken from the San Albino mine during the time it was under seizure. Sandino was a former employee of Butters' mine. He became a general in revolutionary forces but refused to disarm when the peace pact was signed and now has a following of 200 or more men. Sandino first demanded 50 lb. of dynamite from Butters and was refused. With an armed force he took the dynamite, after which he forcibly took possession of the mine. American officers determined to disarm Sandino, and in the clash several bandits and one marine were killed. In the meantime the general had worked the mine, which fact was discovered by Butters when he regained possession. Since then Mr. Butters has been on the alert to detect a possible shipment of bullion from Nicaragua to San Francisco.

Johannesburg Letter

By John Watson
Special Correspondent

Results of Flotation Tests on Platiniferous Sulphide Ores Announced

Johannesburg, July 19—Results of tests carried out by the Minerals Separation, Ltd., on platiniferous sulphide ore from the Lydenburg Central Platinum Co.'s farm Blauwbank, in the Middelburg district of the Transvaal, have recently been published. The crude ore assayed 9.5 dwt. platinum-group metals, 0.83 per cent nickel, and 0.64 per cent copper. The ore was reduced in a pebble mill, with subsequent flotation treatment, yielding a concentrate which assayed platinum-group metals, 92.8 dwt. per ton.; nickel, 9.9 per cent, and copper 6.8 per cent. It is estimated that the following values from one ton of ore would be obtained in practice:

Platinoids: Ore value, 6.0 dwt.; recovery value, 4.8 dwt.; price, £10 per ounce; recovery money value in the ore, 48s.

Nickel: Ore value, 0.6 per cent; recovery value, 0.5 per cent; price, £150 per ton; recovery money value in the ore, 15s.

Copper: Ore value, 0.3 per cent; recovery value, 0.25 per cent; price, £40 per ton; recovery money value in the ore, 2s.

Total recovery value of one ton of ore equals 65s.

Onverwacht Platinum, Ltd., during June milled 2,282 tons of ore, yielding 686 oz. (estimated) of refined platinum and allied metals, which is equivalent to 6.0 dwt. per ton milled. Crosscutting on the 450 level is still in progress. The payable area proved to date on this horizon is 622 sq.ft. of an average value of 4.3 dwt.

THE UNION minister of mines, F. W. Beyers, visited the Lichtenburg district, in the Transvaal, last week, and, addressing the diamond diggers, said the primary object of the precious stones bill was to preserve diggings for "the small man." A pure white diamond, weighing 18½ carats, was found at the diggings at Droegpan, Ventersdorp, on July 15. It is believed to be worth at least £40 a carat, or £740 in all. On Kareepan diggings, near Wolmarans-stad, a diamond weighing 22¼ carats was found recently which brought £310; also, a 10-carat stone found at Ganskuil brought £330.

The British Government has decided to appoint a commission to visit East Africa for the purpose of considering the question of the federation, firstly, of Kenya, Uganda, Tanganyika, and Zanzibar, and possibly, later, that of Northern Rhodesia and Nyassaland. The government hopes to secure Sir Hilton Young as chairman of the commission.

Toronto Letter

By Our Special Correspondent for Northern Ontario

Sudbury Basin Mines, Ltd., Formed—Controls Areas in Several Fields

TORONTO, AUG. 13—A new company to make its appearance on the Standard stock exchange of Toronto is the Sudbury Basin Mines, Ltd., with a capital of 300,000 shares of $1 par. The company was started by Joseph Errington and associates, who interested the Treadwell-Yukon and the Bunker Hill & Sullivan people in the Sudbury lead-zinc area. The company owns 40 claims on the western extension of the Treadwell-Yukon ore zone, and a further large acreage is under option in promising areas throughout the Sudbury basin. On some of these properties, embracing a total of seven square miles, electrical surveys have been made, and these surveys show favorable indications on different sections of the company's holdings. The company also owns 75 per cent interest in the Jarvis Island barite deposit; 10,000 shares of Bathurst Mines, Ltd., and 1,175 shares of T. W. Bathurst Co., Ltd., which companies hold favorable locations in the Narrow Lake district of northern Ontario; and 190,000 shares of Sherritt Gordon Mines, Ltd., which is considered one of the most promising properties in northern Manitoba. The camp lies to the northwest of the Flin Flon, and engineers state that 20,000,000 tons of copper-zinc ore are reasonably assured to a depth of 2,000 ft., on which it is estimated a profit of $3 a ton can be made.

THE Tonopah Canadian Mines, of Gowganda, have stopped milling. This company started its mill last September, at a time when the market for silver was rapidly dropping. Suspension of operations is for an indefinite period, as the management hopes that a better price for silver may be obtained at a later date.

The directors of the Keeley Mines have declared a half yearly dividend of 8 per cent, payable Sept. 15 to shareholders of record Sept. 1. Production is now at the rate of approximately 100,000 oz. a month and will be maintained at such figure as is necessary to enable the payment of the reduced dividend. It is understood that the company proposes to sink a winze to the lower contact of the diabase and Keewatin. A short time ago the Mining Corporation, on its properties adjoining the Keeley, completed a winze through to this geological horizon and encountered high-grade ore. The chances on the Keeley would appear to be too good to permit the directors to overlook this possibility.

A new and rather unusual sight-seeing coach program has been announced by a Toronto company, which proposes to run a regular series of motor-bus tours from Toronto to the mining camps of northern Ontario. For the present it is proposed to operate only as far as Kirkland Lake, on a regular schedule every two weeks, but provision will be made to take special parties to any place throughout the North where roads are available. The new Ferguson Highway, from North Bay to Cobalt, was only recently completed, and it is a rather strange sight for old-timers in that district to see cars with foreign licenses. These are now almost as common as Ontario licenses, and indicate the tremendous advance made in a country which only a comparatively few years ago was virgin forest.

At the Teck-Hughes mine, the second half of the first unit of the new mill is practically ready to start, so that the tonnage at this mill will soon be increased from 150 to 300 tons a day. As this ore is very high grade it will have a marked effect upon production. Good progress is also being made in the construction of the second mill unit of 300 tons' capacity. This will be completed early next year and will give a total capacity of 600 tons at the new mill and 250 tons at the old; development work will provide a large part of the ore for the new addition. Preparations are being made to open up six new levels from the 14 to the 19.

SINCE the proposal of Coniagas to finance the Coniaurum to the extent of $800,000, for which the first-named company was to receive interest at the rate of 7 per cent, plus a bonus of 80,000 shares of common stock, objection has been taken by the Goldale and by another large shareholder, and as a consequence Coniagas has withdrawn its offer. The objection arose out of the fact that the bonus of 80,000 shares has a present market value of $320,000, which was considered to be too much. The money was to be used to finance further development of the property and to provide for the erection of a mill of 500 tons' daily capacity. Just how the finances will be arranged still remains to be seen, but it is probable that the objectors to this scheme are simply trying to obtain better terms. Coniaurum, which is controlled by Coniagas, has still a certain amount of money in the treasury, but before starting on any extensive program of development or any large amount of construction it will need more money. Recent developments on the 1,500 level of the Coniaurum have been encouraging, ore of a better width and higher grade having been found. Preparations are now being made to sink the shaft to 2,000 ft.

An official of the Cooper Gold Mines who recently returned from the company's property in Michipicoten states that diamond-drilling results have been very satisfactory and indicate an important gold ore zone. The company is now starting on a program of deeper drilling preparatory to shaft sinking.

During July the Dome Mines, of Porcupine, treated 67,690 tons and recovered $329,901, an average of $6.92 per ton.

Melbourne Letter

BY PETER G. TAIT
Special Correspondent

Higher Minimum Wage Rate Denied Mine Workers of Western Australia

MELBOURNE, JULY 20—The president of the Western Australia state arbitration court was recently called on to adjudicate on the application of the employees of the gold mines for higher wages. He appointed an official of the government audit department to investigate the accounts of the mining companies, and the official's report was so convincing that any increase would further reduce operations in the mines and works at Kalgoorlie and Boulder that the president of the court refused to alter the present minimum rate of wages, which is 14s. 4d. per day. The proposed award, which is for two years, provides for a 44 hours' week for underground workers and 48 hours for surface employees. Overtime is at the rate of time and a half for the first two hours, and double time thereafter; and on Sundays and holidays, time and a third. For all wet or hot places 1s. 6d. per shift extra is allowed.

The lower metal prices now ruling threaten a restriction of operations at Broken Hill, N.S.W. Whereas in 1925 lead was £39 a ton and spelter more than £40, the prices have now receded to less than £23 and £28 respectively. In 1925 a sliding-scale agreement in regard to wages was entered into by the companies providing for an increase in the rate of wages with each £1 per ton increase in the price of lead, so that the employees have suffered by the lower prices; but hours and conditions at Broken Hill are still the envy of every other mining center of Australia.

That the companies are somewhat concerned with the present position is evident. It is stated that, although the North mine can continue to operate profitably, a mine such as the British, which is owned by the same proprietary —the North Broken Hill Co.—cannot earn a profit. In all probability a continuance of the present prices will result in the closing down of the British mine, which employs about 600 men. Even if other mines along the line of lode do not actually cease production a contraction of operations or a revision of wages and hours would appear to be foreshadowed in the near future.

Palisades Mine Makes Good Recovery

In nine months of milling, the Palisades Mines Co. has produced 190,537 oz. of silver and 770.58 oz. of gold from 11,302.3 tons of ore mined at the company's property at Calistoga, Calif. This record represents a recovery of 16.8 oz. silver and 0.068 oz. gold per ton.

Important Deals Pending In British Columbia

Consolidation of Premier, B. C. Silver, and Sebakwe Holdings Probable —Big Missouri Mine Examined

THE Premier Gold Mining Co. has completed an exhaustive sampling of the B. C. Silver mine, situated to the north of the Premier company's holdings and containing for its full length the Premier ore zone. H. A. Guess, managing director of the Premier company, recently visited the mine.

For several months negotiations have been under way between the Premier company, Selukwe Mining & Finance Co., which controls the B. C. Silver mine, and Sebakwe & District Mines, which controls a consolidation of claims on the same ore zone to the north of B. C. Silver Mines' holdings. The sampling by the Premier company and Mr. Guess' visit to the mine seem to indicate that the negotiations may come to a head in the near future and that the consolidation of the three concerns may become an accomplished fact.

Briefly, the conditions are that the Premier company owns a 450-ton mill, which easily could be rated to a higher capacity, and a transportation system, 11½ miles long, to tide-water, but, during the last six years, the company has depleted its own ore reserve by approximately 700,000 oz. of gold and 18,000,000 oz. of silver. B. C. Silver Mines has developed five important oreshoots, some of them over considerable horizontal and vertical lengths, but has neither mill nor transportation system. Sebakwe has demonstrated the continuity of the ore zone into its territory and has developed an oreshoot on one level. From an economical and mining point of view a consolidation seems to be desirable. The Premier company already owns approximately a one-third interest in the B. C. Silver mine.

W. M. Archibald, manager of mines for the Consolidated Mining & Smelting Co. of Canada, has made an examination of the Big Missouri mine, at the head of Salmon River valley, Portland Canal division, for his company, which, it is understood, is negotiating for a controlling interest of the stock of the Big Missouri Mining Co. in consideration for money to develop the mine and equip it with a mill. Several shoots of rich gold-silver ore and low-grade ore have been opened on different parts of the Big Missouri's holdings.

Disquieting rumors as to the meagerness of Dunwell Mines' ore reserve has caused a slump in the stock of the company, which dropped from $1.30 to 80c. in a couple of days on the Vancouver and Victoria exchanges. R. M. Stewart, president of the company, who recently returned from the mine to Victoria, says that the rumor has no foundation.

The Erickson and Bussy claims, in the Beaver district, 50 miles north of Mayo, Yukon Territory, which recently were taken over under lease and option by the Consodilated Mining & Smelting Co. of Canada, are said to be promising.

Societies, Addresses, Reports

San Francisco Section Meets With De Golyer and Bain

The San Francisco Section of the American Institute of Mining and Metallurgical Engineers held a special meeting on Aug. 12, at which President De Golyer and Secretary Bain were entertained, and at which both addressed the meeting, which was attended by sixty or more members. Chairman Grant presided. T. A. Rickard introduced the men from the East. Secretary Bain briefly reviewed the status of the Institute and made a plea for a greater degree of class consciousness in the Institute. He pointed out that increased interest in the Institute and greater solidarity would advance the importance of the engineers' organization and would be of great advantage to its members.

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Butte Officials to Lecture at State School of Mines

A COMMITTEE of the Butte, Mont., Chamber of Commerce has been cooperating with the local officials of the Montana State School of Mines in an effort to be of service to the school. This committee, composed of Erle V. Daveler, general manager, Butte & Superior Mining Co.; Paul Gow, manager of the North Butte Mining Co., J. A. Poore and Charles Leonard, local attorneys, and Willard Thompson, a local business man, has arranged, with the co-operation of the mining companies and engineers of the district, Chancellor Brannon and President Craven of the State School of Mines, and J. H. Rowe, of the State Board of Education, the addition of a lecture course to be given weekly on Wednesday evenings for the benefit of the students of the School of Mines. The lectures will be made a part of the curriculum, and credit will be given the students who attend and display interest in them. It is proposed to have the lectures limited in length to one hour or one and a half hours, and to have them open to the public and the engineers of the district.

The following speakers have recently been asked to lecture for the coming year: W. B. Daly, manager of mines, Anaconda Copper Mining Co.; G. W. Roddewig, general superintendent, Elm Orlu Mining Co.; M. I. Wright, manager, Ingersoll-Rand Co.; Cliff Woodward, chief mechanical engineer, Anaconda Copper Mining Co.; C. L. Berrien, general superintendent, Anaconda Copper Mining Co.; F. A. Linforth, assistant chief geologist, Anaconda Copper Mining Co.; W. A. O'Kelly, engineer, Anaconda Copper Mining Co.; George Moser, master mechanic, Butte & Superior Mining Co.; A. S. Richardson, ventilation engineer, Anaconda Copper Mining Co.; L. V. Bender, general superintendent, Anaconda Copper Mining Co.; Guy Sheridan, Timber Butte Milling Co.; R. Hull, construction engineer, Anaconda Copper Mining Co.; B. N. Rickard, manager, American Smelting & Refining Co.; B. S. Morrow, superintendent of concentrators, Anaconda Copper Mining Co.; D. M. Kelly, counsel, Anaconda Copper Mining Co.; Frederick Laist, metallurgical engineer, Anaconda Copper Mining Co.; R. B. Caples or A. E. Wiggin, Anaconda Copper Mining Co.; H. D. Cooley, Jr., Butte & Superior Mining Co.; Sam Barker, general manager, Butte Copper & Zinc Co.; J. L. Boardman, Safety chief, Anaconda Copper Mining Co.; E. V. Daveler, general manager, Butte & Superior Mining Co.

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Pure Minerals and Flotation

EXPERIMENTAL work conducted at the Intermountain Station of the U. S. Bureau of Mines on the flotation of pure minerals has resulted in the development of facts which are of a fundamental nature in regard to the mechanism of flotation. During the course of this work the fact that minerals of high degree of purity are more or less rare has been established. Considerable difficulty has been experienced in procuring minerals of a sufficient degree of purity for this work, and various sources have been investigated with no great amount of success in procuring sufficiently large lots from any one source.

The greater portion of the work on the more common minerals, such as galena, sphalerite and pyrite, has reached an advanced stage, and the data obtained have made it necessary to combine the sulphide minerals with the non-metallics in order to simulate conditions as they would occur in the natural ore. As ores are of excessive variable composition, it has been deemed advisable to include in these mixtures of the more common minerals small quantities of oxide and carbonate minerals, such as malachite, azurite, and chrysocolla, together with the common minerals of copper, including chalcopyrite, bornite, and covellite. Because the work outlined covers a large field, it is necessary to procure amounts of these minerals totaling up to 100 lb. or more, and it has been desirable to procure supplies from the same localities, so that the character of the minerals may be the same in each case.

Great assistance could be rendered the Intermountain Station in this work by contributions of samples, either large or small, of the minerals mentioned or of information regarding localities from which 100-lb. lots of these pure minerals could be obtained. Communications regarding this matter should be addressed to the Director of the Department of Mining and Metallurgical Research of the University of Utah, Salt Lake City.

Personal Notes

W. G. Anderson is in eastern Oregon, where he is examining mining property.

W. L. Honnold passed through San Francisco on his return from Michigan to Los Angeles.

John Roxburgh has been appointed manager of the Springs Mines, Ltd., on the Far East Rand.

F. R. Lynch, deputy chairman of the Anglo-American Corporation, has left Johannesburg for England.

Carl Davis, consulting mining engineer, has left Johannesburg to take up his permanent residence in England.

H. C. Wilmot has been engaged in making examinations on Vancouver Island and in the Kootenay district of British Columbia.

H. P. Banks, manager of the ore and metal department of W. R. Grace & Co., recently returned to New York from Chile and Peru.

Charles L. Coleman of Providence, R. I., has been awarded the Douglas fellowship in mining research by McGill University, Montreal.

Frederick R. Burton, of Waterville, Quebec, has been awarded the Sir William Dawson fellowship in mining by McGill University.

J. B. Tyrrell, managing director of Kirkland Lake Gold Mining Co., Ltd., is in New York for a short visit. His headquarters are in Toronto.

Ira B. Joralemon, consulting engineer of San Francisco, recently returned to the coast after a trip to Salt Lake on professional business.

Frederick Laist arrived in New York from Europe on the "Leviathan" last week and left immediately for his headquarters at Anaconda, Mont.

Milnor Roberts, after attending several engineering meetings recently in England, went to Lake Como, in Italy. He will return soon to Seattle.

Mr. and Mrs. Fred Wartenweiler, of Johannesburg, have been visiting friends in California. They intend to go to the Mining Congress at Toronto this month.

F. W. Beyers, the Union Minister of Mines and Industries, left Pretoria on July 19 for Capetown on his way to Canada, to attend the Empire Congress in Ontario.

F. C. Dyer and J. T. King have been appointed associate professors of mining engineering in connection with the faculty of applied science of the University of Toronto.

Frank Smith, field engineer for the Tonopah, has returned from a visit to the Red Lake area, where he made an examination of the Foley-Kelly claims, bringing back some rich samples.

Prof. J. S. De Lury, of Manitoba University, who will soon assume the chair of geology at Saskatchewan University, is making a survey of the mineral resources of Saskatchewan.

B. Orpen, the retiring manager of the Robinson Deep, and Mrs. Orpen left South Africa recently *en route* for Canada, where Mr. Orpen will attend the second Empire Mining Congress.

L. D. Mills, consulting engineer of The Merrill Company, of San Francisco, is on a trip through the eastern part of the United States and Canada, including a visit to the Porcupine district and the Flin Flon mine in Manitoba.

James Houston has been appointed manager of the Ostrom Gold Mines, in the Boston Creek section of the Kirkland Lake area of northern Ontario, in succession to G. E. Silvester, who has resigned on account of ill health.

E. R. Ramsey, heretofore in charge of the metallurgical division of the Dorr Company, in Denver, has been appointed to the position of assistant general sales manager with headquarters in New York. He will be succeeded in Denver by A. D. Marriott. A. T. Hastings has been made assistant manager of the metallurgical division and will continue at Los Angeles.

Reading left to right are shown the Hon. Randolph Bruce, Lieutenant-Governor of British Columbia; Lady Howard; and Sir Esme Howard, British Ambassador to the United States. Taken at Government House, Victoria, on the occasion of Sir Esme's recent visit

THE Hon. Randolph Bruce, Lieutenant Governor of British Columbia and one of the pioneer mining men of the Province, has received the honorary degree of Doctor of Laws from the University of Glasgow, Scotland. He graduated in engineering at the university forty years ago. Governor Bruce has been mining in British Columbia for thirty years. First with associates, and latterly alone, he has owned and operated the Paradise mine, in the Lake Windermere district, East Kootenay, for a quarter of a century. The mine now is being developed under lease and option by the Victoria Syndicate, of London.

OBITUARY

Philip George Hartley, a well-known prospector, died recently at Germiston. He was about seventy years old. He prospected in the Transvaal in the early eighties and spent several years with the De Beers company at Kimberley. For the last year he had been at Elandspatte diamond diggings, working a large claim.

James Sinclair Brodie, who was on the staff of the Modderfontein Dynamite Factory (Transvaal) for more than twenty-two years, died in Johannesburg recently, at the age of seventy-three. He was a native of Glasgow and had been at Nobel's Ardeer factory in Ayreshire, coming to the Transvaal in connection with construction work in the acid department.

Herman Zadig, a stock broker of San Francisco and long known to the mining fraternity of California and Nevada, died on July 14, 1927, in San Francisco, aged eighty years. Mr. Zadig interested himself in Comstock, Tonopah, and Goldfield properties. In spite of his years he was a frequent visitor to mining districts and his cheerful optimism extended his wide acquaintance.

Recent Technical Publications

GASES, DUST AND HEAT IN MINES. By K. Neville Moss, professor of mining in the University of Birmingham, England. Published by J. B. Lippincott Company, Philadelphia, and Charles Griffin & Company, London. Pp. 232; 37 illustrations. Price $6.

More and more attention is being given yearly to the general subject of ventilation of mines. This book will come as a very welcome addition to the literature on the subject, since it is especially fitted for the use of mine superintendents, foremen, and others intent on improving conditions underground. In the first four chapters the author deals with the elementary physics of the atmosphere and the gases commonly met with underground. In Chapter V the question of dust is exhaustively treated. The latest appliances for the estimation of dust in the atmosphere are described, as also their method of use. The author then proceeds to the discussion of the two great factors in ventilation—the humidity of the air and its velocity, a combination of these two being an index of its cooling power. The various instruments used for their determination are described and the Katathermometer receives detailed notice, and sound instructions are given for its manipulation to obtain the most accurate results. The author goes on to treat the whole subject of high air temperatures in mines, their origin and effect on the miner, and finally suggests means for conditioning the air to make it a more efficient cooling medium. This part of the book is of more than ordinary interest. The author and his associates have conducted numerous extremely important physiological experiments on coal miners, mechanics, and others, and the results obtained are fully set forth. The author concludes that high temperatures in themselves do not injure a man's health, but they unquestionably diminish his efficiency, although quite astonishing degrees of acclimatization are reached and men are working in temperatures of 100.5 deg. F. dry bulb and 86.5 deg. F. wet bulb and an air velocity giving the exceedingly low wet Kata cooling factor of 4.0: yet these men are producing slightly more tons per man-shift than other gangs more favorably situated in the same mine.

As regards remedies for high wet bulb temperatures, the author touches on several methods used. The important pioneer work done at the Morro Velho mine is described and other suggested cooling and dehumidifying systems are mentioned.

Professor Moss concludes this highly instructive work with a chapter on ankylostomiasis, and the inclusion of this chapter is fully justified, since it is in hot, damp, unventilated places that the hookworm most frequently finds its breeding grounds.

E. G. LAWFORD.

BAUXITE. A Treatise Discussing in Detail the Origin, Constitution, Known Occurrences, and Commercial Uses of Bauxite; and including Particulars Regarding the Present Conditions of the Aluminum Industry and the Peculiar Importance of Cryolite in the Extraction of Aluminum from Bauxite. By Cyril S. Fox, D.Sc., M.I.M.E., F.G.S. Geological Survey of India. Crosby Lockwood & Son, London. Pp. 312, illustrated. Price 30 shillings net.

The brief title "Bauxite" on the cover of Dr. Fox's book is amplified in the subtitle on the title-page. To read it alone is sufficient to whet the mental appetite of those looking for information on the ores of aluminum.

Dr. Fox is exceptionally well informed on the subject, as he prepared for the Indian Geological Survey, of which he is a member, its report "The Bauxite and Aluminous Laterite Occurrences of India," which appeared in 1923.

In the opening chapter of Bauxite he discusses the relationship between bauxite, laterite, and terra rosa and sums up the opinions of the principal writers on the subject. He then describes the mode of occurrence of deposits in various parts of the world in Chapter II. Chapters III, IV, and V are devoted to physical and chemical composition and probable mode of formation. Chapter VI, on the bauxite occurrences of the world, may be considered the main chapter of the book, on which the author must have spent considerable time and taken infinite pains in the collection of data from widely separated sources. It is a great pity that one so well qualified for the work as Dr. Fox could not have visited the many producing centers and studied the deposits personally. In his paragraph on British Guiana the references to the papers by the late Sir John Harrison and J. B. Harrison are a little confusing and to the average reader might imply that Sir John and J. B. Harrison were two different men.

The chapters on mining, preparation, marketing, and uses of bauxite are appropriately included in a book of this kind and are of especial interest to the economic geologist. In all works on scientific subjects there is bound to be a certain amount of over-lap of fields of endeavor. This is the case with the closing chapters, which cover the aluminum industry, and though in this instance it is treated in a broad way, it may be considered more within the field of the metallurgist rather than that of the geologist. However, the work would not have been the well-rounded volume that it is, if this phase of the industry had been omitted.

The last two chapters, which may properly be termed an appendix, are devoted to statistics and a bibliography of the industry. Both are very complete and invaluable to the reference reader.

The book as a whole is a valuable addition to technical literature, and the author is to be congratulated on the wide range covered and the great care exercised in the selection of material.

LLOYD T. EMORY.

THE LATOUCHE SYSTEM OF MINING—This system, as developed and successfully used at the Beatson mine of the Kennecott Copper Corporation, is fully described by Bevan Presley in Technical Publication No. 20 of the A.I.M.E. This very interesting "large-tonnage" method is described in minute detail, and a feature of the paper is the series of illustrations showing the appearance of the block of ore at various stages of the stoping operation. In this method the preparation of the block, before actual stoping operations, is important and extensive. It is very fully discussed and detailed cost sheets covering this part of the work are presented. Other cost data presented in detail include cost of breaking ground, cost of bulldozing and passing the ore through the grizzlies, and costs of loading, tramming, and hoisting. The cost of various mine supplies laid down at the property and the wage schedule at Latouche are also given.

STOPE FILLING AT NORTH MOUNT LYELL MINE—In the July 5 number of *Chemical Engineering and Mining Review* (Melbourne, Australia) E. Berkley describes the method of stope filling in use at the Lyell mine. The method is a novel one in that water is added to the waste broken at surface to bring it to a degree of viscosity necessary to cause its passage down a reticulation of waste passes so disposed that all stopes are supplied by three main passes from surface. The author describes the somewhat elaborate preparations necessary for filling the first floors of stopes, but proceeds to show the great ease and cheapness of the method as applied to all subsequent lifts.

THE GLOW TEST FOR METALS OF THE PLATINUM GROUP. By C. W. Davis. This pamphlet is a reprint of an article published in the *Journal of the Franklin Institute* and gives an account of the author's discoveries in connection with the testing for metals of the platinum family. Mr. Davis discusses the theory of contact catalysis and the factors which influence the glow reaction. Experiments are described which investigate factors involving the nature of the support, heating the catalyst, temperature of gas and catalyst, kind of gas, limit of glow test, and nature of the solutions. As a result of these researches the author finds that the method of Curtman and Rothberg may be safely applied only in the absence of copper, cobalt, nickel and silver. The author concludes by outlining his suggestion for a modified procedure which he claims adds reliability to this test for the platinum group metals.

Copies of this pamphlet may be obtained from J. B. Lippincott Company, Philadelphia.

RECENT PATENTS

Rock Drill Equipment

No. 1,636,813. July 26, 1927. Guido Elster, Herne, Germany.

No. 1,636,934. July 26, 1927. Walter H. Goodland and John H. Goodland, Butte, Mont.

No. 1,637,000. July 26, 1927. August H. Katterjohn, assignor to Denver Rock Drill Manufacturing Co., Denver, Colo.

No. 1,637,001. July 26, 1927. The same.

No. 1,637,185. July 26, 1927. Charles Hansen, assignor to Ingersoll-Rand Co., Jersey City, N. J.

No. 1,637,203. July 26, 1927. Fred M. Slater, assignor to Ingersoll-Rand Co., Jersey City, N. J.

No. 1,637,192. July 26, 1927. Francis A. Jimerson, assignor to Ingersoll-Rand Co., Jersey City, N. J.

No. 1,637,204. July 26, 1927. The same.

No. 1,637,912. Aug. 2, 1927. Gustave M. Nell and William G. Kale, assignors to Cleveland Rock Drill Co., Cleveland, Ohio.

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BLASTING—No. 1,627,991. May 10, 1927. W. O. Owen, Washington, D. C. A blasting process in which a mixture of oxygen-containing gas and hydrocarbon fuel under substantial super-atmospheric pressure is ignited by an electric spark.

METAL EXTRACTION—No. 1,628,012. May 10, 1927. H. N. Tracy, Los Angeles, Calif. Metal is extracted from finely divided ore by forcibly throwing it into a body of metal-absorbing liquid in a non-oxidizing atmosphere.

FLOTATION PROCESS—No. 1,628,046. May 10, 1927. J. Herman, Los Angeles; A. W. Allen, Berkeley; and H. R. Newitt, Los Angeles, Calif. A process of flotation for the treatment of oxidized metalliferous ores.

FLOTATION PROCESS—No. 1,628,151. May 10, 1927. C. H. Keller, San Francisco, Calif., assignor to Minerals Separation North American Corporation, New York City. A process involving the use of xanthate and a substance containing an anion group including a metal adapted to react with the xanthate.

CRUSHER — No. 1,628,619, May 10, 1927. C. G. Sprado, Milwaukee, Wis., assignor to Allis-Chalmers Manufacturing Co., Milwaukee, Wis. Design for a gyratory crusher.

MINING METHOD — No. 1,630,589. May 31, 1927. W. P. Tabor, Adena, Ohio. A method in which the roof strata is supported by timbers imbedded at one end in solid ore and supported by posts in the mined-out area.

BORE-HOLE APPARATUS—No. 1,630,694. May 31, 1927. A. F. Dixon, New York City, assignor of one-third to T. C. Bannon and one-third to D. Upham, New York City. An apparatus for orienting geological specimens in bore holes.

MINE TRACK TIE—No. 1,631,034, May 31, 1927. E. G. Holst, Lavoye, Wyo. A rail tie on which the rails are held by a locking device.

SULPHURIC ACID PROCESS — No. 1,631,139. June 7, 1927. E. L. Larison, Anaconda, Mont. A process for the manufacture of sulphuric acid.

MINE CARS—No. 1,631,313 and 1,631,314. June 7, 1927. H. P. Field, Berwick, Pa., assignor to the American Car & Foundry Co., New York City. Designs for car doors.

FLOTATION APPARATUS—No. 1,631,382. June 7, 1927. T. M. Owen, Wallace, and M. P. Datton, Mullan, Idaho. Design for a horizontal mechanically agitated flotation machine.

AMALGAMATION MACHINE—No. 1,631,434. June 7, 1927. C. E. Smith, Azusa, Calif. A vibrating amalgamating and concentrating machine.

LINERS FOR TUBE MILLS—Nos. 1,631,971 and 1,631,972. June 14, 1927. P. T. Lindhard, Brooklyn, N. Y., assignor to F. L. Smith & Co., New York City.

Liner blocks for tube mills consisting of longitudinal metal bars.

ORE CRUSHER—No. 1,632,124. June 14, 1927. T. Freiberg, Prescott, Ariz. An ore crusher operating in a trough ahead of a screen located across the end of the trough.

MINERAL SEPARATOR—No. 1,632,210. June 14, 1927. R. S. Baldwin and W. A. Johnston, Spokane, Wash. An oscillating table having a concave surface covered with a corrugated mat.

HOIST. No. 1,633,543. July 21. Omar E. Clark, Denver, Colo.

New design for a mine hoisting engine.

SYSTEM FOR MINING. No. 1,632,800. July 21, 1927. James W. Pearce, Chicago, Ill. Assignor to Goodman Manufacturing Co., Chicago, Ill.

The method of mining which consists in initially driving several substantially parallel and intersecting cross-entries to form rectangular blocks, removing the material from the blocks by scraper loading devices extending along working faces formed in adjacent parallel working entries and loading in transportation entries intersecting the working entries, removing the material along predetermined staggered working faces on opposite sides of each working entry and connecting the working operations in adjacent working entries to leave pillars of pyramidal or inverted V-shaped form along the central portions of each of the blocks.

BELT CONVEYOR ARRANGEMENT. No. 1,636,680. July 26, 1927. Espey Telle Cannon, assignor to American Smelting & Refining Co., New York. Combination of a storage bin, traveling hopper, and belt conveyor.

ROTARY DRUM FILTER. No. 1,636,739. July 26, 1927. Leon Hertenbein, Levalloie-Perret, France.

A drum filter in combination with a special device for the removal of the filtered solids.

METALLIC COMPOSITION. No. 1,636,763. July 26, 1927. Henrik Boving, assignor to Western Electric Co., Inc., New York.

A process for making alloys, one or more of the constituents being highly volatile, by molding under sufficient pressure to blanket volatilization.

SELECTIVE FLOTATION OF MINERALS FROM CRUDE ORES. No. 1,636,974. Oba Wiser, El Paso, Texas. July 26, 1927.

A process using sulphurous acid for the selective flotation of lead and zinc.

LUBRICATING SYSTEM FOR ROCK-DRILL SHARPENERS. No. 1,637,012. July 26, 1927. Arthur H. Skaer and Omar E. Clark, Denver, Colo., assignors to the Denver Rock Drill Manufacturing Co.

A design for an oiling system.

SCRAPER. No. 1,637,073. July 26, 1927. Alfred B. Esseltine, assignor to the Goodman Manufacturing Co., Chicago, Ill.

New design for scraper bucket.

ORE FURNACE. No. 1,637,163. July 26, 1927. Francis M. Simonds, assignor of one-half to A. Filmore Hyde, New York.

A design for a furnace with a number of distributing chambers, distributed vertically.

METHOD OF PRODUCING GEM MATERIALS. No. 1,637,291. July 26, 1927. Leon H. Barnett, New York.

An improvement in existing methods by allowing molten cast iron to cool in a vessel which will not allow of its free expansion.

MINERAL FEED AND PROCESS OF PREPARING SAME. No. 1,637,428. Aug. 2, 1927. Virgil R. Rupp, Quincey, Illinois.

A process which consists in treating rock phosphate with concentrated sulphuric acid, thus eliminating a portion of the fluorine and forming calcium sulphate.

METHOD OF PRODUCING MERCURY. No. 1,637,481. Walter Glaeser, Brooklyn, New York, Aug. 2, 1927.

A process involving the treatment of the finely divided ore with a hypochlorite of an alkaline or alkaline earth metal.

ROOF SUPPORT FOR UNDERGROUND CHAMBERS. No. 1, 637,586. Aug. 2, 1927. James S. Pates, Washington, Pa.

A device for a cap composed of channel iron sections.

STEAM SHOVEL. No. 1,637,689. Aug. 2, 1927. Joseph Pierce Endersby, Vancouver, B. C.

An opening device for power shovel buckets.

METHOD OF TREATING ORES. No. 1,637,838. Aug. 2, 1927. H. Simmonds, New York, assignor of one half to A. Filmore Hyde, New York,

Treatment of a sulphide ore by first heating at a relatively low temperature in a reducing or neutral atmosphere and then in a slightly oxidizing atmosphere to cause burning of a portion of the sulphur to complete the process of partial desulphurizing and softening with evolution of elemental sulphur.

MARKET AND FINANCIAL NEWS

Imports of Copper into Japan Show Big Increase

THE *Japan Advertiser* 1926-1927 Annual Review, discussing the copper situation in that country, states that because the price of copper in the United States last year was lower than at any time during the last three years, Japanese buyers, further encouraged by the rising value of the yen, imported 13,910 tons, compared with 3,200 tons in 1925.

It was believed in Japan that the American Copper Export Association would boost copper prices, and there is no doubt that the buying in Japan was principally speculative. Copper prices, however, quite contrary to all beliefs ever since this association was organized in October, 1926, have been falling, and Japanese copper market manipulators have had their calculations badly upset.

Domestic production in 1926 showed, however, little change from the 1925 output. Supplies on hand were always much greater than ability to absorb them. Luckily for the producer and exporter, even though prices were low, and because of that very fact, copper was in good demand throughout the year, and at the end of 1926 stocks were not greatly in excess of those at the end of 1925.

The cost of mining in the United States has been much decreased, but in Japan there are only one or two first-class mines which are operating at a profit; all the others are working at a loss, Japanese producers, sensing the trend of future copper business, in 1922 obtained an increase in the customs duty from 1.2 yen to 7 yen per hundred kin (133 lb.). Market prices at once were put up to cover the advance, and for a time imports fell off, but the 1926 figures show imports gaining again, although most of the purchases were made under conditions favorable for speculative orders.

Demand Good

Domestic production in 1926 was 63,600 tons. Demand was very good, and, encouraged by low prices, consumers made heavy purchases, and the total absorbed in all industries during the year is put at 76,900 tons, an increase of 9.44 per cent in domestic consumption. Prices were high in January at 49.9 yen a hundred kin, and low in December at 45.8 yen. These prices are the lowest known in the past three years.

The market in Japan follows that abroad very closely, but for the last year there has been little movement, as the gains abroad, brought about by the formation of the export copper association in the United States, have been offset by the gains in yen exchange, holding the price about level.

The principal development in the market during the year has been the formation, after three years of negotiation, of a joint sales guild among the various producers of the raw material. The participants are Furukawa, Osaka Denki Bundo, Fujita, Mitsubishi, Kobe Steel Works, Sadoshima Copper, Okada Copper, and Mitani Copper. Its purpose, not yet achieved, is to restrict production and standardize prices. It will act as a supplementary body to what is known as the "Wednesday Meeting," at which all copper men gather to fix current prices.

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National Lead Gets Titanium Control

IT IS REPORTED in the *Wall Street Journal* of Aug. 19 that National Lead Co. has exercised its option to purchase the Titan Co., of Norway, which controls European patents on processes for manufacture of titanium paint pigment. The Titan Co. also owns one of the largest and richest known deposits of ilmenite, the principal ore of titanium, and a plant for the manufacture of titanium products. National Lead also concluded an agreement with Die Interessengemeinschaft Farbenindustrie Aktiengesellschaft—commonly known as the I. G. Co.—to manufacture and market in Germany and Central Europe titanium pigments from the Norwegian ores. This arrangement is on an equal share basis. Furthermore, National Lead has purchased control of Société Industriale de Titane, which has been manufacturing the same products in France. Since National Lead already owns a 75 per cent control of the Titanium Pigment Co., which owns ilmenite deposits in Virginia, Florida, and other sections, purchase of the European patents and Norwegian deposits puts the company in a commanding position in the world field and assures it of an adequate supply of raw material for many years.

Titanium pigment is comparatively new in the paint industry. It is somewhat more expensive than white lead, but has a considerably greater spreading power, about half as much being required to paint any given area. It is also completely inert and not affected by acids and corrosive substances that affect other paints.

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Sales of Silver by the Government of India Depress Market

According to advices from London, under the pressure of sales, now known to have been on account of the Indian government, the silver market has been heavy, although prices did not recede sharply until Aug. 2 and 3. Bears have covered freely and, as a consequence, the resistance of the market, should supplies be ample, would be less effective owing to the absence of their potential support. The announcement was made by the Indian government in the following form:

"The government of India has recently sold silver bullion held in the Indian paper currency reserve to an amount of approximately 9,200,000 oz., representing the total stock of mine silver held by the government of India. As this silver ceases to form part of the currency reserve, its place will be taken by Indian government rupee securities which will be reduced as the sterling proceeds from the sale of silver are received."

The fact of the announcement having been made officially rather suggests that the Indian government has no immediate intention of operating further at the moment, but nevertheless the sales have continued to depress the market.

The two following days the market recovered to 25¼d., but there was a fresh fall on Aug. 11 to 24 15/16d. on renewed selling from India and China. The transactions during the week were very large, as in addition to re-sales by India and China of previous purchases, there were also some big bear sales.

The opinion expressed in London was that although there did not appear to be any factors to justify much further fall, it was quite possible that the uneasiness caused by the government sales would lead to slightly lower prices. The silver market is always particularly difficult to appraise: so much depends on the operations of Indian and Chinese merchants.

It is said that the popularity of currency notes and the development of the banking habit are responsible, in part, at any rate, for the comparatively large return of rupees.

STATISTICAL NOTES

NEVADA CONSOLIDATED shows some decrease in production, but in spite of this net operating profit increased as compared with the first quarter of the year. The quarterly report recently issued to shareholders shows financial results of operations for the quarter, as compared with those of the preceding quarter, to be as follows:

	Second Quarter 1927	First Quarter 1927
Operating profit from copper production	$1,545,115	$1,514,336
Value of precious metals	247,496	260,884
Miscellaneous revenues, including income from subsidiaries	218,500	272,485
Total operating income	$2,011,112	$2,047,707
Depreciation	416,903	423,903
Net income	$1,594,208	$1,623,803
Copper produced net lb.	55,641,299	57,940,796

The total quantity of company ores milled and smelted during the quarter, says the report, was 2,423,048 tons. Of this total 2,411,054 tons was concentrating ore, averaging 1.33 per cent copper, and 11,994 tons was direct-smelting ore shipped to smelters. In addition to company ores, 70,487 tons of custom ore was milled or smelted at the Nevada plants. The average daily tonnage of company ores milled at all concentrators was 26,495, as compared to 27,414 tons per day for the first quarter. The average recovery in the form of concentrates from all company material milled during the period was 88.79 per cent of the total copper contained therein, corresponding to 23.71 lb. of copper per ton of ore treated, compared to a recovery of 87.88 per cent and 23.68 lb. per ton for the previous quarter. The net cost per pound of copper produced, after crediting revenue from gold and silver and other miscellaneous earnings and income from subsidiaries, was 9.25c., as compared with 9.43c. per pound for the first quarter. These costs include all operating and general charges of every kind except depreciation and reserve for federal taxes.

THE LAKE SHORE MINE, of Kirkland Lake, continues to establish new records, and for the quarter ending June 30 tonnage and production were much greater than in any previous quarter. During the period 60,098 tons was treated, giving a total production of $810,047, or an average of $13.48 a ton. The grade is slightly in excess of the previous quarter's record, but considerably less than the figures for the two quarters preceding that. Total output was $30,000 in excess of that of the best previous quarter. For the fiscal year ended June 30 last, the total tonnage was 219,934 tons and production was $3,105,047, an average of $14.51 a ton.

BRITISH COLUMBIA INCREASES COPPER PRODUCTION—The distribution of Canada's copper output in 1926 was: British Columbia, 67 per cent; Ontario, 31 per cent; Quebec, 2 per cent. The total output was 133,094,942 lb., compared with 111,450,518 lb. in 1925. Of this production, British Columbia was responsible for 89,108,017, compared with 69,221,600 lb. in 1925.

AHUMADA LEAD CO. during the six months ended June 30, 1927, earned net income of $229,425 after depreciation, taxes, and other charges, equivalent to 19c. per share. This compares with $597,523, or 50c. per share, in the first half of 1926. Net income for the second quarter of 1927 was $54,283 after above-noted charges, comparing with $175,142, in the preceding quarter and $233,686, in the June quarter of the previous year. In the six months ended June 30, Ahumada Lead produced 31,165 tons of ore, for which the smelter returned 15,-864,423 lb. of lead, an average of 509 lb. a ton. The company had on hand in cash and cash assets on June 30, 1927, $268,803.

CALLAHAN ZINC-LEAD made a surplus of $13,689 as a result of operations during the second quarter of the year. The following figures are abstracted from the report recently issued by the company:

Earnings:		
Net value of shipments	$83,404	
Interest earned on bonds	6,285	
Total earnings		$89,690
Expenses:		
Mining and milling costs	$64,556	
Flotation royalties	1,188	
General and administrative expenses	5,793	
Maintenance costs at interstate property	4,461	
Total costs and expenses		$76,000
Surplus for the period		$13,689

Note: The general and administrative expenses include expenses of the annual meeting of directors. Maintenance costs at the old property include pro rata of taxes and insurance on plant and mill at that property and rental of mill site.

The principal features of the mining and milling operations during the quarter were as follows:

Ore mined, tons	13,570
Average lead content, per cent	5.47
Average silver content, ounces per ton	4.11
Concentrates shipped, tons	1,256
Lead content, lb.	1,339,839
Silver content, ounces	50,897
Total recovery of lead, per cent	91.2
Cost of mining per ton (including development)	$4.012
Cost of milling per ton	$0.746
Flotation royalties per ton	$0.088
Total costs per ton (including development)	$4.846

SANTA GERTRUDIS reports a total of 187,391 dry tons of ore milled during the quarter ended June 30. Total Santa Gertrudis, Dos Carlos, and Inversiones revenue, after allowing for development and participation of owners but before deducting reserve for depreciation, depletion, and other charges, was $462,598. During the quarter capital expenditure by the Dos Carlos company amounted to $20,272. Developments on the 20th level of the Dos Carlos mine are highly satisfactory. Crosscut south from the Dos Carlos shaft on this level has cut the Dos Carlos vein, which at this point carries 3.77 dwt. gold and 42.1 oz. silver per ton over a width of 6.7 ft. Subsequent drifting on the vein opened up 288 ft. in ore averaging 2.46 dwt. gold and 30.7 oz. silver per ton over a width of 10.8 ft.

SAN FRANCISCO MINES OF MEXICO reports the results of its operations in Mexico during July, with the financial return, as follows:

Ore treated, tons	21,560
Residues treated, tons	2,000
Lead concentrates produced, tons	2,800
Zinc concentrates produced, tons	3,500
Estimated net smelter returns:	
On lead concentrates	$160,356
On zinc concentrates	99,905
Total	$260,261
Operating expenses	$115,437
Estimated operating profit	$144,824

Little Change in Dividends

TOTAL dividends paid by mining companies in August were slightly higher than those paid in May, the corresponding month of the second quarter. Teck-Hughes, Kirkland Lake gold bonanza, is a semi-annual payer, so that its August distribution swells the total. Freeport Texas Sulphur, one of the group of highly profitable producers of sulphur, paid an extra of 25c. per share in addition to the regular quarterly disbursement of $1. The only absentees from the May list are California Rand, which is said to be on a bi-monthly dividend basis, and Gladstone Mountain, a high-grade lead producer in the State of Washington, which has suspended dividend payments pending a better lead market and the development of a stronger financial position.

Mining Dividends Paid in August

Companies in the United States	Situation	Per Share	Total	Per Cent Annual Yield
American Smelting & Refining	Various	$2.00 Q	$1,219,960	5.0
Anaconda Copper, c, z, l, s	Various	0.75 Q	2,250,000	6.3
Bunker Hill & Sullivan, l, s	Idaho	0.75 M	245,250	12.0
Colorado Fuel & Iron, pfd	Various	2.00 Q	40,000	6.8
Freeport Texas, s	Texas	1.25 QX	912,305	5.3
General Development, h	Various	0.25 Q	30,000	....
Homestake Mining, g	S. D.	0.50 M	125,580	10.0
International Nickel, pfd., n. c	Ont., W. Va.	1.50 Q	133,689	5.7
Miami Copper	Ariz.	0.375 Q	280,168	9.8
New Cornelia Copper	Ariz.	0.50 Q	900,000	9.5
New Jersey Zinc	Various	2.00 Q	981,632	j 6.8
U. S. Steel, pfd	Various	1.75 Q	6,305,497	5.3
United Verde Extension, c	Ariz.	0.75 Q	787,500	12.5
Vanadium Corporation	Various	0.75 Q	282,853	6.2
Companies in other countries				
Amparo Mining, g, s	Jalisco	0.01 Q	20,000	....
Cerro de Pasco, c, s	Peru	1.00 Q	1,122,842	6.5
Dome Mines, g	Ont.	0.25 Q	288,333	14.0
Hollinger Consolidated Gold	Ont.	0.10 4 wks	492,000	6.3
Lucky Tiger Combination, g, s	Sonora	0.05 M	35,766	....
Teck Hughes, g	Ont.	0.10 S. A.	$37,357	....
Wright-Hargreaves (new), g	Ont.	0.05 Q	£275,000	3.2
Total and average			$16,965,732	

c, copper; z, zinc; l, lead; s, silver; h, holding company; g, gold; n, nickel; s, sulphur; t, tin; Q, quarterly; SA, semi-annual; M, monthly; BM, bi-monthly; QX, $1 regular and $0.25 extra; j, based on dividends for the last twelve months.

The Market Report

Metal Prices Sag Slightly in Continued Quiet Market

New York, Aug. 24, 1927—With the exception of tin, the prices of all of the more important non-ferrous metals are somewhat lower in both the American and English markets than they were a week ago. Considering the quietness in the demand, however, prices have held very well, especially those of copper. Not a great deal of activity is expected until after Labor Day, Sept. 5.

No Interest in Copper

The situation in copper is almost exactly the same as it was last week. The large producers are asking from 13¼ to 13⅜c., delivered, with full realization that these quotations are only nominal and to be obtained only where special conditions apply. Those who make a practice of selling their intake from week to week are quoting from 13.05 to 13⅛c. for customary Eastern deliveries, but are selling only a very moderate tonnage, there being little interest by consumers just now at any price. Meanwhile copper is being consumed at a lively rate, even if consumers are not so active as early in the year, and a good buying movement is expected to assert itself early in September. Some requests have been made to anticipate deliveries, consumers apparently preferring to do this where possible than to book further orders. Dealers are apparently holding more copper than usual, and several hundred tons have been picked up during the week as low as 13c., delivered. This seems to be largely of one brand. The foreign demand has been as quiet as the domestic, though a little more interest was taken abroad today, coincident with a reduction in the c.i.f. price of the export association from 13.65 to 13½c.

Lead Continues to Decline

The week has witnessed a further fall in lead prices, but in spite of the relatively low figure at which the metal was obtainable, consumers have shown little interest and the volume of sales has been small. There is an atmosphere of business inactivity which is quite generally apparent outside the metal markets, and the Stock Exchange has shown a dull and heavy tone all the week. Some purchasers have requested earlier delivery of their forward orders, a fact which may be read as indicating a desire to watch carefully the trend of the market in the immediate future and an idea among consumers that they may possibly obtain even lower prices than those prevailing today. In accordance with the general downward trend of the market, the American Smelting & Refining Co. today reduced its contract price from 6.75c. to 6.60c., New York. In general the dullness of the market seems to be a passing phase. One important consumer arranging for his October lead delivery demanded a larger tonnage than in any previous month: a fact which indicates that there is no actual falling off in demands for the metal.

Zinc Declines 5 Points

Zinc is only slightly lower than last week, quotations the last two days being in the neighborhood of 6.30c., St. Louis, compared with 6.35c. a week ago. Forward deliveries are inclined to be slightly higher than prompt. Sales have kept up remarkably well, considering the quietness in the other metals, the total being about the same as for the two weeks previous. Orders have been well divided between metal for prompt, September, and October delivery. High-grade zinc is unchanged at 8c. nominal, for small tonnages of spot metal, delivered in the East. On Prime Western, the New York market is at the customary freight differential of 35c. per 100 lb. above St. Louis.

Daily Prices of Metals

Aug.	Copper	Tin		Lead		Zinc
	Electrolytic, N. Y.	99 Per Cent	Straits	N. Y.	St. L.	St. L.
18	12.875	63.125	64.125	6.65@6.75	6.30@6.40	6.35@6.375
19	12.875	63.25	64.25	6.65@6.75	6.325	6.325@6.35
20	12.875	63.25	64.25	6.65@6.75	6.30@6.325	6.325@6.35
22	12.875	62.75	63.75	6.60@6.75	6.25@6.30	6.325
23	12.875	62.50	63.75	6.55@6.75	6.20@6.30	6.275–6.325
24	12.825@12.85	63.25	64.375	6.55@6.60	6.20@6.30	6.275–6.30
	12.869	63.021	64.083	6.667	6.294	6.325

Average prices for calendar week ending Aug. 20, 1927, are: Copper, 12.883; 99 per cent tin, 63.271; Straits, 64.167; N. Y. lead, 6.708; St. Louis lead, 6.354; zinc, 6.356; and silver, 54.500.

The above quotations are our appraisal of the major markets for domestic consumption based on sales reported by producers and agencies. They are reduced to the basis of cash, New York or St. Louis, as noted. All prices are in cents per pound.

Copper, lead, and zinc quotations are based on sales for both prompt and future deliveries; tin quotations are for prompt delivery only.

In the trade, copper prices usually are quoted on a delivered basis; i.e., delivered at consumer's plant. As delivery and interest charges vary with the destination, the figures shown above are net prices at refineries on the Atlantic seaboard. Delivered prices in New England average 0.225c. per pound above those quoted, and prices at so-called Middle West destinations, 0.325c. above.

Quotations for copper are for ordinary forms of wire bars, ingot bars, and cakes. For ingots an extra 0.05c. per pound is charged and there the other extras for other shapes. Cathodes are sold at a discount of 0.125c. per pound.

Quotations for zinc are for ordinary Prime Western brands. Zinc in New York is now quoted at 0.35c. per pound above St. Louis, this being the freight rate between the two points.

Quotations for lead reflect prices obtained for common lead, and do not include grades on which a premium is asked.

London

Aug.	Copper			Tin		Lead		Zinc	
	Standard		Electrolytic						
	Spot	3M		Spot	3M	Spot	3M	Spot	3M
18	55 1/16	55 7/16	62	291¼	288 7/8	23	23 3/8	28	27 7/8
19	55 3/16	55 9/16	62	291 3/4	285 5/8	22 3/4	23 1/8	28	27 7/8
22	55 3/16	55 9/16	62	289½	284½	22 3/4	23 1/8	27 7/8	27 13/16
23	55	55 3/8	62¼	288 1/8	284 1/8	22 3/4	23 1/8	27 3/4	27 3/4
24	54 3/4	55 3/16	61¾	292	286½	22 3/4	23 1/8	27 15/16	27 3/4

The above table gives the closing quotations on the London Metal Exchange. All prices in pounds sterling per ton of 2,240 lb.

Silver, Gold, and Sterling Exchange

Aug.	Sterling Exchange "Checks"	Silver		Gold London	Aug.	Sterling Exchange "Checks"	Silver		Gold London
		New York	London				New York	London	
18	4.85 5/8	54 5/8	25 1/4	84s10¾d	22	4.85 5/8	54 1/8	24 15/16	84s11 d
19	4.85 5/8	54 1/2	25 1/8	84s11 d	23	4.85 5/8	54 3/8	25 3/16	84s10½d
20	4.85 5/8	54 1/4	25	.....	24	4.85 5/8	54 3/8	25 1/8	84s11½d
					Avg.		54.375		

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London silver quotations are in pence per troy ounce of sterling silver, 925 fine. Sterling quotations represent the demand market in the forenoon. Cables command three-eighths cent premium.

Tin Prices Show Little Change

The tin market, which is never entirely governed by consumers' demands, remained fairly firm, but most of the sales were to dealers. Consumers, by large forward buying at the low prices which prevailed recently, seem to have provided themselves with most of their immediate requirements.

Canadian Dollars at Par

Foreign exchange movements have been unimportant. On account of the seasonal movement of wheat, Canadian dollars have advanced to par. Closing cable quotations on Tuesday, Aug. 23, were as follows: francs, 3.92⅛c.; lire, 5.4475c.; and marks, 23.81c. Canadian dollars, par.

Silver Quiet and Steady

The silver market during the last week has been quiet and steady, continued buying for China's account supporting the market. Though India has shown some interest, Indian parities are still below prevailing rates.

Mexican Dollars (Old Mexican pesos): Aug. 18th, 41⅛c; 19th, 41c; 20th, 40¾c; 22nd, 40⅝c; 23rd and 24th, 40⅞c.

Other Metals

Quotations cover large wholesale lots unless otherwise specified. London prices are according to latest mail advices.

ALUMINUM—Per lb. 98 or 99 per cent grade, price of leading interest, 26c.; outside market, 25.30@25.80c.

ANTIMONY—Per lb., duty paid. New York: Chinese brands, range for the week, spot business, 11⅜@11¾c. October arrivals ⅛c. higher. Market quiet. Cookson's "C" grade, spot, 17¾c. Needle antimony nominally 8c. for lump and 10c. for powdered. White oxide, 16½c.

BISMUTH—Per lb., New York, in ton lots, $1.85@$2.10. London, 8s.

CADMIUM—Per lb., New York, 60c.

IRIDIUM—Per oz., $107@$110 for 98 @99 per cent sponge and powder.

NICKEL—Per lb. ingot, 35c.; shot, 36c.; electrolytic, 39c. (99.75 per cent grade) for single lots of spot metal.

PALLADIUM—Per oz., $53@$55. Small lots bring up to $58. Pure metal as a constituent of crude platinum, nominal.

PLATINUM—Official price quoted by the leading interest on small miscellaneous orders for refined metal, per oz., $72. Dealers and refiners quote the trade for refined metal, per oz., cash, $64.50@$66. Market dull and narrow. Pure metal as a constituent of crude platinum, at $62. Continues very dull.

QUICKSILVER—Per 76-lb. flask, range for week $118½@119½, nominal. Market shows little life. San Francisco wires $121.33. London, £20¾@£22.

The prices of Cobalt, Germanium Oxide, Lithium, Magnesium, Molybdenum, Monel Metal, Osmium, Radium, Rhodium, Ruthenium, Selenium, Tellurium, Thallium, Tungsten, and Zirconium are unchanged from the issue of Aug. 6.

Metallic Ores

MANGANESE ORE—Per long ton unit of Mn. c.i.f. North Atlantic ports, minimum 47 per cent Mn, 36@38c. Caucasian, washed, 53@55 per cent, 40c. Chemical grades unchanged from quotations in the Aug. 6 issue.

TUNGSTEN ORE—Per unit of WO_3, N. Y.: Wolframite, $10.25@$10.50. Western scheelite, $10.75@$11. Market dull and prices largely nominal.

Chrome, Iron, Molybdenum, Tantalum, Titanium, Uranium, and Vanadium Ores are unchanged from quotations in the Aug. 6 issue.

Zinc Ore Weaker but Lead Improves

Joplin, Mo., Aug. 20, 1927

Blende		Per Ton
High		$45.35
Premium blende, basis 60 per cent zinc	$44.00@	45.00
Prime Western, basis 60 per cent zinc	42.00@	43.00
Fines and slimes, 60 per cent zinc	39.00@	41.00
Average settling price, all zinc		41.65
Galena		
High		$90.65
Basis 80 per cent lead	$87.50@	90.00
Average settling price, all lead		87.77

Shipments for the week: Blende, 15,880; lead, 2,264 tons. Value, all ores the week, $860,100.

Several buyers declare they offered no more than $42 basis for Prime Western grades of blende, but others are contracting for concentrates that cannot be purchased on a $42 basis, evidently agreeing to make up the $1 difference in some form of evading penalties. Purchases totalled 12,120 tons today. Shipments and production continue to balance closely, with no marked change in the reserve ore situation, with less than 18,000 tons of unsold ore in the bins.

Buyers will acknowledge paying no more than $87.50 basis for lead, but some settlements were made this week at prices that indicated a basis price, or its equivalent in omitting deductions, of $90 per ton.

Platteville, Wis., Aug. 20, 1927

Zinc Blende	Per Ton
Blende, basis 60 per cent zinc	$45.75
Lead Ore	
Lead, basis 80 per cent lead	$85.00

Shipments for the week; Blende, 1,037 tons; lead, none. Shipment for the year: Blende, 42,853; lead, 1,090 tons. Shipments for the week to separating plants, 2,018 tons blende.

Non-Metallic Minerals

Amblygonite, Asbestos, Barytes, Bauxite, Borax, Celestite, Chalk, China Clay, Diatomite, Emery, Feldspar, Fluorspar, Fuller's Earth, Garnet, Gilsonite, Graphite, Greensand, Gypsum, Iron Oxide, Lepidolite, Limestone, Magnesite, Mica, Monazite, Ocher, Phosphate, Potash, Pumice, Pyrites, Quartz Rock Crystal, Silica, Spodumene, Sulphur, Talc, Tripoli, and Zircon are unchanged from prices in the Aug. 6 issue.

Mineral Products

ARSENIOUS OXIDE (White Arsenic)—Per lb., 4c. Fair buying. London, Cornish white, per long ton, £16½@£16¾.

Calcium Molybdate, Copper Sulphate, Sodium Sulphate (Salt Cake), Sodium Nitrate, and Zinc Oxide are unchanged from prices in the Aug. 6 issue.

Ferro-Alloys

FERROCHROME—Per lb. of contained chromium, 60@70 per cent chromium, 4@6 per cent carbon, 11@11½c.

FERROMANGANESE—Per long ton, domestic and foreign, 78@82 per cent, $90, furnace, for delivery during second half 1927. Spiegeleisen, 19@21 per cent, $33@$34 f.o.b. furnace.

FERROTUNGSTEN—Per lb. of W contained, 75@80 per cent, 96@98c. f.o.b. works. Dull.

Ferrocerium, Ferrophosphorus, Ferrosilicon, Ferrotitanium, Ferro-uranium and Ferrovanadium are unchanged from prices in the Aug. 6 issue.

Metal Products

ROLLED COPPER—Per lb., f.o.b. mill, sheets, 22c.; wire, 15¼c.

LEAD SHEETS—Per lb. full rolled, 9c.; clipped, 9.25c.

NICKEL SILVER—Per lb., 28¾c. for 18 per cent nickel Grade A sheets.

YELLOW (MUNTZ) METAL—Per lb., dimension sheets, 19¼c.; rods, 16¼c.

ZINC SHEETS—Per lb., f.o.b. mill, 10c.

Refractories

Chrome Brick, Fireclay Brick, Magnesite Brick, Silica Brick and Zirkite are unchanged from quotations in the Aug. 6 issue.

Iron, Steel, and Coke Steady

Pittsburgh, Aug. 23, 1927

The steel industry is operating at substantially the same rate as in July, or at slightly under 70 per cent. There is no distinct improvement in demand, although usually seasonal improvement has come before this date. The chief defections this year in steel demand are in the oil and gas fields, where there has been a large decrease, and the automobile trade, where there has been a substantial decrease. Railroad demand is off only slightly. Fabricated-structural steel lettings showed neither gain nor loss in the first half of the year, but recently have been heavy.

Pig Iron.—The Valley market stays dull, but has prospects of improvement in tonnage, particularly in foundry iron. Bessemer, $18.50; basic, $17.25; foundry, $17.50, f.o.b. Valley furnaces.

Connellsville Coke—Prices are steady, with demand light, although increasing in heating coke. Spot furnace, $3@$3.25; spot foundry, $4@$4.75.

Current Prices of Mining Supplies

Many price changes have occurred since this section last appeared here. Cast iron pipe has declined quite generally. Changes in structural materials in the various cities have fairly well balanced one another. Fluctuations in lumber prices have varied from $1 down to $1 up. The market for supplies has remained stationary.

SHEETS—Quotations are per 100 lb. in various cities from warehouse also the base quotations from mill:

	Pittsburgh, Large Mill Lots	St. Louis	Chicago	San Francisco	New York
Galvanized No. 24	$3.85	$5.25	$4.80	$5.25	$4.95

STEEL RAILS—The following quotations are per ton f.o.b. Pittsburgh and Chicago for carload or larger lots:

	Pittsburgh		Birmingham	Chicago
	Current	One Year Ago		
Standard bessemer rails	$43.00	$43.00	$43.00	$43.00
Standard openhearth rails	43.00	43.00	43.00	43.00

TRACK SUPPLIES—The following prices are base per 100 lb. f.o.b. Pittsburgh for carload lots, together with the warehouse prices at the places named:

	Pittsburgh		Chicago	St. Louis	San Francisco	Birmingham
	Current	One Year Ago				
Standard spikes, ⅝-in. and larger	$2.80	$2.90	$3.55	$3.65	$3.85	$3.00
Track bolts	3.90	$3.90@4.15	4.55	4.60	5.35	3.90
Standard section angle bars, splice bars or fish plates	2.75	2.75	3.40	3.75	4.00	2.95

STRUCTURAL MATERIAL—Following are base prices in carload lots, f.o.b. mill, Pittsburgh and Birmingham together with quotations per 100 lb. in less than carload lots, from warehouses at places named:

	Pittsburgh, Mill	Birmingham Mill	New York	Dallas	St. Louis	Chicago	San Francisco
Beams, 3 to 15 in.	$1.75@1.80	$2.05	$3.34	$4.10	$3.25	$3.10	$3.10
Channel, 3 to 15 in.	1.75@1.80	2.05	3.34	4.10	3.25	3.10	3.10
Angles, 3 to 6 in., ¼ in. thick	1.75@1.80	2.05	3.34	4.10	3.25	3.10	3.10
Tees, 3 in. and larger	1.75@1.80	2.05	3.34	4.10	3.35	3.10	3.10
Plates ¼-inch thick	1.75@1.80	1.95	3.34	4.10	3.25	3.10	3.10

WIRE ROPE—Discounts from list price, f.o.b. New York and east of Missouri River, on regular grades of bright and galvanized are as follows:

Cast steel round strand rope	20%
Galvanized steel rigging and guy rope	7½%
Round strand iron and iron tiller	5%
Plow steel round strand rope	35%
Special steel round strand rope	30%
Galvanized iron rigging and guy rope	12½%

	New York	Cleveland	Chicago
DRILL ROD (from list)	60%	55%	50%

WROUGHT IRON AND STEEL PIPE—The following percentage discounts are to jobbers for carload lots at Pittsburgh mill:

	Steel			Iron		
	Inches	Black	Galv.	Inches	Black	Galv.
BUTT WELD—	..1 to 3	62	50½	1 to 1½	30	13
LAP WELD—	2½ to 6	59	47½	3 to 6	28	13

WROUGHT-STEEL PIPE—From warehouses at the places named the following discounts hold for steel pipe:

	Black		
	New York	Chicago	St. Louis
2½ to 6 in. lap welded	48%	51%	46%

CAST-IRON PIPE—The following are prices per net ton for carload lots:

	New York		Birmingham	Chicago	St. Louis	San Francisco
	Current	One Year Ago				
6 in. and over	$44.60	$51.60@53.60	$34.00	$42.20	$39.60	$43.00

NUTS—Hot pressed or cold punched, square or hexagonal, blank or tapped, full kegs or cases, discount 50-10% from new list April 1, 1927 at warehouses in New York and vicinity.

HOLLOW TILE—Price per block in carload lots to contractor for hollow building and partition tile.

	New York						Perth Amboy N. J., Factory
	Current on Trucks‡	One Year Ago	Chicago	Philadelphia	St. Louis	San Francisco‡	
4x12x12	$0.1027	$0.1112	$0.076	$0.105	$0.068	$0.108	.....
6x12x12	.1541	.1667	.104	.....	.09	.156	$0.2388*
8x12x12	.1926	.2084	.142	.21	.126	.244	.2956†

* 10x12x12; † 12x12x12. ‡ Partition tile.

MACHINE BOLTS—Square heads and nuts, up to 1x30-in., full kegs or cases discount 50% from new list April 1, 1927 at warehouses in New York and vicinity.

LUMBER—Prices of rough Douglas Fir No. 1 common, in carload lots to contractors at yards in San Francisco.

	6-8 and 12 Ft.	10-16-18 and 20 Ft.	22 and 24 Ft.	25 to 32 Ft
3x3 and 4	$26.00	$27.00	$28.00	$31.00
3x6 and 8	26.00	27.00	28.00	31.00
4x4-6 and 8	26.00	27.00	28.00	31.00

Wholesale prices to dealers of long-leaf, yellow pine (rough) timbers. To contractors in New York City, delivered from lighters to job, $5@$10 additional.

	New York		Chicago	
	20 Ft. and Under	22-24 Ft.	Up to 20 Ft., Pine	Up to 32 Ft., Fir
3x4 to 8x8	$43.00	$44.00	$38.50	$39.00
3x10 to 10x10	50.00	51.00	45.00	39.00
3x12 to 12x12	57.00	58.00	56.00	39.00

Other Cities	8 x 8-In. x 20 Ft. and Under				12 x 12-In. 20 Ft. and Under	
	Pine	Fir*	Hemlock	Spruce	Pine	Fir*
Boston	$48.00	$47.50†	$50.00	$52.00	$58.00	$57.50
Cincinnati	37.00	73.00	73.00	85.00	48.00	77.00
Denver	.....	33.25	34.25	34.25	.....	34.25
Minneapolis	42.50	38.75	34.50	.....	47.00	39.75
Kansas City, Mo.	41.50	39.75	.....	.....	55.50	40.25
Philadelphia	48.00	36.00	38.00	45.00	62.00	36.00

*Douglas fir. † Prime.

NAILS—The following quotations are per keg from warehouse:

	Pittsburgh, Mill	Chicago	San Francisco	Dallas	St. Louis	Montreal
Wire	$2.55	$2.95	$3.45	$4.25	$2.83	$4.95
Cut	2.85@2.90	....	5.00	5.00	2.95	5.00

PORTLAND CEMENT—Prices to contractors per bbl. in carload lots *without bags*. Cash discount not deducted.

	Current	One Month Ago	One Year Ago
New York, del. by truck	$2.35@2.50	$2.35@2.50	$2.50@2.60
Chicago, f.o.b.	2.05	2.05	2.10
Cleveland, f.o.b.	2.24	2.24	2.29

LIME—Warehouse; New York quotes bbl. 280 lb. net; Chicago, 180 lb.:

	Hydrated, per Ton		Lump, per Barrel	
	Finishing	Common	Finishing	Common
New York	$18.20	$11.00	$3.50	$2.10@$3.00
Chicago	20.00	12.00	....	1.50

LINSEED OIL—These prices are per gallon:

	New York		Chicago	
	Current	One Year Ago	Current	One Year Ago
Raw in barrel (5 bbl. lots)	$0.89½	$0.84	$0.83½	$0.95

WHITE AND RED LEAD—In 100-lb. kegs, base price in cents per pound:

	Dry		In Oil	
	Current	1 Yr. Ago	Current	1 Yr. Ago
Red	13.75	15.25	15.25	16.75
White	13.75	15.25	13.75	15.25

HOSE—Quotations at New York warehouses:

Fire Protection 50-Ft. Lengths
Underwriters' 2½-in. coupled, single jacket (net) ..... $0.68 per ft.

Air—Best Grade
¾-in., per ft. ..... 3 ply $0.34 4 ply $0.42

Steam—Discounts from List
First grade .... 40% Second grade ..... 40-5% Third grade 50%

RUBBER BELTING—List price 6-in., 6 ply, $1.83 per lin.ft. for rubber transmission belting.
Best grade ..... 50% Second grade 50-10%

LEATHER BELTING—List price, 24c. per lin.ft. per inch of width for single ply at New York warehouses:

Grade	Discount from list
Medium	40-5%
Heavy	30-10%

PACKING—Prices per pound:

Rubber and duck for low-pressure steam, ¼ in.	$0.95
Rubber sheet	.50
Rubber sheet, wire insertion	.80

MANILA ROPE—Per lb., ¼-in. and larger, 1,200-ft. coils.

Atlanta	$0.27	New Orleans	$0.21
New York	.24½	Seattle	.23
Chicago	.23	San Francisco	.22½

EXPLOSIVES—Prices per pound of dynamite in small lots:

	Gelatin	
	40%	60%
New York	$0.265	$0.2875
Minneapolis	.1917	.2123
Denver	.2025	.2275
Seattle	.165	.19
Cincinnati	.22	.245
San Francisco	.1625	.1925

FLOTATION OIL—Pine tar, 50 gal. bbl., gross weight 500 lb., f.o.b. New York, carload lots, per gal. $0.35

CHEMICALS—Prices f.o.b. producing point, per lb.:

Zinc dust, 550 lb. casks	$0.10½@.11
Litharge, casks	.09½
Sodium cyanide, 220 lb. single case lots	.18@.22
Calcium carbide, in drums	.05@.06

Mining Stocks—Week Ended Aug. 20, 1927

Stock	Exch.	High	Low	Last		Last Div.
COPPER						
Anaconda	New York	46⅜	45⅜	46	Jy.16, Au.22 Q	0.75
Arcadian Consol.	Boston	....	....	*25	....	....
Ariz. Com'l	Boston	6¼	6	6¼	Jy. 18, Jy. 30	0.25
Calaveras	N. Y. Curb	....	....	1⅜	....	....
Calumet & Arizona	New York	70	69	70	Ju. 13, Ju. 20 Q	1.50
Calumet & Hecla	Boston	69½	69½	69⅝	Au. 31, Se.15 Q	0.50
Cerro de Pasco	New York	64⅜	63	63⅝	Jy.14, Au.1 Q	1.00
Chile Copper	New York	36⅝	35½	36¼	Se. 2, Se. 30, Q	0.62½
Con. Coppermines	N. Y. Curb	3	2⅛	3	....	....
Copper Range	Boston	13½	13½	13½	Ap.2, My.2, A	1.00
Crystal Copper	BostonCurb	*48	*36	*47	....	....
East Butte	Boston	2	1⅜	1⅜	Dec., 1919	0.50
Granby Consol	New York	39½	38½	39½	Jn.15 Jy. 1 Q	1.00
Greene Cananea	New York	61½	57⅞	59⅜	Nov., 1920	0.50
Howe Sound	New York	41¼	39⅝	40¾	Apr.1,Apr.15 Q	1.00
Inspiration Consol	New York	20⅛	19⅜	19½	Ma.17, Ap.4, Q	0.25
Iron Cap	Boston Curb	1⅜	1 1/16	1⅛	....	....
Isle Royale	Boston	10½	10½	10½	Fe.4, Fe.19, Q	0.50
Kennecott	New York	69⅜	66½	68¾	Se. 2, Oc. 1, Q	1.25
Magma Copper	New York	36	35½	36	Jn.30, Jy.15, Q	0.75
Mason Valley	N. Y. Curb	*88	*80	*88	....	....
Miami Copper	New York	15⅛	14⅜	15	Au.1, Au.15 Q	0.37½
Mohawk	Boston	42	41½	41⅔	Jy.30, Se.1 Q	1.00
Mother Lode Coal	New York	2⅜	2⅜	2⅜	Jn.10, Jn.30	0.25
Nevada Consol	New York	14⅜	14⅛	14⅝	Jn. 3, Jn. 7 Q	0.37½
New Cornelia	Boston	22	21⅛	22	Au.5, Au.22 Q	0.50
Noranda	N. Y. Curb	24⅜	21¼	22¼	....	....
North Butte	Boston	1⅜	*97	1⅜	Oct., 1918	0.25
Ohio Copper	N. Y. Curb	1⅜	1 1/16	1 1/16	Sept. 1926	0.03
Old Dominion	Boston	....	....	13¾	Dec., 1918	1.00
Phelps Dodge	N. Y. Curb	....	....	116	Jn.18, Jy.1 Q	1.50
Quincy	Boston	15¼	15	15¼	March, 1920	1.00
Ray Consolidated	New York	15	15	15	Ap.20, Ap. 30	0.25
St. Mary's Min. Ld.	Boston	21	20⅛	21	Fe.10, Ma.10	2.00
Seneca Copper	New York	1⅜	1⅛	1⅛	....	....
Shattuck Denn	Boston Curb	5⅛	4⅞	5⅛	....	....
Tenn. C. & C.	New York	8⅞	8⅛	8⅜	Au.31,Se.15, Q	0.12½
United Verde Ex	N. Y. Curb	24⅜	24	24⅜	Jy.6, Au.1 Q	0.75
Utah Copper	New York	119⅜	119⅛	119¼	Jn. 17, Jn. 30 Q	1.50
Utah Metal & T	Boston	1⅛	1⅛	1 1/16	Dec., 1917	0.30
Walker Mining	Salt Lake	*57	*56	*57	....	....
NICKEL-COPPER						
Internat. Nickel	New York	68¼	64¾	66¾	Jn. 16, Jn. 30 Q	0.50
Internat. Nickel pfd.	New York	....	....	109	Ap. 14, My. 2 Q	1.50
LEAD						
Gladstone Mtn	Spokane	....	....	*19½	June, 1927	0.005
National Lead	New York	116⅜	108	115¼	Se. 16, Se. 30 Q	1.25
National Lead pfd	New York	110	108½	109⅜	Se.1, Se. 30 Q	1.75
St. Joseph Lead	New York	41⅛	41	41	Se.10,Se.20, QX	0.75
ZINC						
Am. Z. L. & S.	New York	7¼	7	7	May, 1917	1.00
Am. Z. L. & S. pfd.	New York	40½	40	40⅛	Nov., 1920	1.50
Butte C. & Z.	New York	4⅜	4	4⅛	De. 9, De. 24	0.50
Butte & Superior	New York	8⅜	8¼	8⅜	Jn. 17, Jn. 30 Q	0.50
Callahan Zn-Ld.	New York	1⅜	1⅛	1⅛	Dec., 1920	0.50
Consol.Lead&Zinc'A'	St. Louis	12½	12⅛	12⅜	Ma.15, Ap.1 Q	0.25
Eagle-Picher	Cincinnati	27	26⅛	26⅛	Au.15, Se.1 Q	0.40
Eagle-Picher pfd	Cincinnati	....	....	116	Jn.30, Oc.15 Q	1.50
New Jersey Zn	N. Y. Curb	185	184	185	Jy.20,Au.10 QX	2.00
United Zinc	N. Y. Curb	....	....	*55	....	....
Yellow Pine	Los Angeles	*36½	*36	*36	Dec. 1925 Q	0.04
GOLD						
Alaska Juneau	New York	2	1⅞	1⅞	....	....
Argonaut	Toronto	*36	*32	*36	....	....
Barry-Hollinger	Toronto	*40	*32½	*40	....	....
Con.W.Dome L.new.	Toronto	*10½	*9	*10½	....	....
Cresson Consol. G.	N. Y. Curb	2⅜	2⅜	2⅜	Ma.31,Ap.10 Q	0.10
Dome Mines	New York	7½	7	7⅛	Jn. 30, Jy. 20 Q	0.25
Golden Cycle	Colo.Springs	†1.76	†1.75	....	Au.30, Se.10 Q	0.04
Hollinger Consol	Toronto	18.05	16.50	17.15	Au. 24, Se. 9 F	0.10
Homestake Mining	New York	61½	61½	61½	Au.21, Au. 25 M	0.50
Kirkland Lake	Toronto	2.00	1.75	1.86	....	....
Lake Shore	Toronto	22.80	20.79	20.80	Jn.1, Jn.1 X	0.20
McIntyre-Porcupine	New York	25⅝	25⅝	25⅝	Au.1, Se.1 Q	0.25
Portland	Colo.Springs	†*31	†*28	....	Ap.6, Ap.15, Q	0.02
Rand Mines	New York	....	....	45⅛	Au.22-29 Am.Sh.1	1.52
Teck-Hughes	Toronto	9.31	8.76	9.16	Jy.21, Au.1	0.10
Tom Reed	Los Angeles	*50½	*50½	*50½	Dec., 1926	0.02
Tough-Oakes	Toronto	*40	*26	*32	....	....
United Eastern	N. Y. Curb	....	....	*44	July, 1924	0.05
Vipond Cons	Toronto	*61	*50½	*59	Apr.1, Apr.15	0.03
Wright-Hargreaves	Toronto	6.50	6.03	6.42	Jy.15, Au.1 SA	0.05
GOLD AND SILVER						
Carnegie Metals	Pittsburgh	14	13½	13½	....	....
Con. Cortez	N. Y. Curb	....	....	*19	....	....
Con. Virginia	San Francisco	*3½	*2½	*3½	....	....
Dolores Esperanza	N. Y. Curb	....	....	*50	July, 1923	0.05
Premier Gold	N. Y. Curb	2 5/16	2⅛	2⅛	Jn.14, Jy. 5	0.08
Tonopah Belmont	N. Y. Curb	....	....	1⅛	Ma.15, Ap.4	0.08
Tonopah Extension	N. Y. Curb	....	....	*51	Apr. 1925	0.05
Tonopah Mining	N. Y. Curb	2	1⅞	2	Ma.31, Apr.21	0.07½
West End Consol	N. Y. Curb	....	....	*7	Mar., 1923	0.05
Yukon Gold	N. Y. Curb	....	....	*45	June, 1918	0.02
SILVER						
Beaver Consol	Toronto	1.55	1.34	1.39	May, 1920	0.03
Castle-Trethewey	Toronto	*75	*61	*63	....	....
Coniagas	Toronto	5.00	4.85	5.00	May, 1924	0.12½
Keeley	Toronto	*95½	*93	*95½	Se.1, Se.15	0.08
Lorrain Trout Lake	Toronto	....	....	*55	July, 1925	0.05
McKinley-Dar.-Sav.	Toronto	*15¼	*15	*15	Oct., 1920	0.03
Mining Corp. Can.	Toronto	3.08	3.00	3.00	Jn. 29, Jy.15	0.12½
Nipissing	N. Y. Curb	6¼	5¼	6¼	Jn.30, Jy.20	0.07½

Stock	Exch.	High	Low	Last		Last Div
SILVER-LEAD						
Ahumada	New York	4½	3⅞	4½	Ma. 25,Ap.4,QX	0.12½
Bingham Mines	Boston	48	47½	48	Jn.27, Jy. 5 Q	1.00
BunkerHill&Sullivan	N. Y. Curb	104¼	104	104	Jy. 30, Au.4 X	0.75
Cardiff M. & M.	Salt Lake	*41	*41	*41	Feb. 5, 1927	0.10
Chief Consol	Salt Lake	2.62½	2.62½	2.62½	Nov., 1926 Q	0.10
Consti'nMng.&Mill'g	Spokane	....	....	*20	....	....
Erupcion	Boston Curb	*85	*75	*75	Jn. 25, Jy. 5 Q	0.07½
Eureka Lily	Salt Lake	1.37½	1.25	1.35	....	....
Federal M. & S.	New York	....	....	1.50	Jn.25, Jn.29 Spec.	$10
Federal M. & S pfd.	New York	94¾	94¾	94¾	Au. 25, Se.15 Q	1.75
Hecla Mining	N. Y. Curb	16½	16	16½	My.4, Ju. 15 Q	0.25
Highland-Surprise	Spokane	....	....	*12	....	....
Iron King Mining	Salt Lake	*51	*50	*51	....	....
Keystone Mining	Salt Lake	....	....	20	Au. 12, Au. 26	0.07½
Lucky Jim	Spokane	....	....	*18½	....	....
Lucky Tiger-Com	Kansas City	†7.10	†6.80	....	Au.9, Au.20	0.05
Mammoth Mining	Salt Lake	1.80	1.80	1.80	Jn.10, Jn.20 Q	0.05
Marsh Mines	Spokane	....	....	*87½	....	....
North Lily	Salt Lake	4.00	3.90	4.00	....	....
Park Utah	New York	7¼	7	7¼	Jn. 25, Jy. 1 Q	0.20
Plutus Mining	Salt Lake	....	....	1.85	Jy. 10, Jy. 15 Q	0.10
San Rafael	San Francisco	....	....	*24	....	....
Silver King Coal	Salt Lake	8.95	8.75	8.95	Jn. 20, Jy. 1 Q	0.25
Silversmith	Spokane	....	....	*26	Oct., 1926 Q	0.02
Strattons Mines	Spokane	....	....	*47	....	....
Sunshine M. Co.	Spokane	....	....	1.25	....	....
Tamarack-Custer	Spokane	....	....	*25½	Sept., 1924	0.25
Tintic Standard	Salt Lake	13.75	13.50	13.50	Jn.15, Jn.28	0.40
Utah-Apex	Boston	5⅜	5¼	5¼	Oct., 1926	0.25
IRON						
Bethlehem Steel	New York	63½	59¾	62⅜	Se. 2, Oc. 1.	1.75
Cleveland-Clifs Iron	Cleveland	100	100	100	Jy. 15, Jy. 25 Q	1.00
Colorado Fuel & Iron	New York	81⅝	74¼	79½	May, 1921	0.75
Gt. North'n Iron Ore	New York	97½	95	96½	Dec. 6, Dec. 28	0.75
Inland Steel	New York	53½	52½	53½	Au. 15, Se. 1 Q	0.62½
Replogle Steel	New York	....	....	12½	....	....
Republic I. & S.	New York	69	67	69	Au. 15, Se. 1 Q	1.00
Republic I. & S. pfd.	New York	105½	105	105	Se. 15, Oc. 1 Q	1.75
Sloss-Sheffield S. & I.	New York	128	122	128	Jn. 10, Ju. 20 Q	1.50
Sloss-Shef. S.&I. pfd.	New York	....	....	107½	Jn. 20, Jy. 1 Q	1.75
U. S. Steel	New York	137⅜	130½	136⅝	Au. 30, Se. 29 Q	1.75
U. S. Steel, pfd.	New York	134½	133½	133¾	Au.1, Au. 30 Q	1.75
Virginia I. C. & C.	New York	41	41	41	Jan., 1924	1.50
Virginia I.C.&C. pfd.	New York	....	....	60½	Ju. 15, Jy. 1	2.50
DIAMONDS, PLATINUM, ALUMINUM, VANADIUM, TIN						
De Beers Consol	New York	....	....	27½	Jn. 26, Jn.30	1.45
So. Am. G. & P. New	N. Y. Curb	....	....	2⅜	....	....
Alum. Co. of Amer.	N. Y. Curb	90½	87½	90¼	....	....
Alum. Co. ofAmer.pf.	N. Y. Curb	104	104	104	Jn. 15, Jy. 1 Q	1.50
Vanadium Corp.	New York	56⅜	53½	55⅜	Au. 1, Au. 15 Q	0.75
Patino M. & E.	New York	20⅜	20	20½	Ap. 27, My. 5	1 sh.
ASBESTOS						
Asbestos Corp.	Montreal	....	....	23¾	Jan., 1926	1.50
Asbestos Corp. pfd.	Montreal	....	....	88	Jn.30, Jy.15 Q	1.75
SULPHUR						
Freeport, Texas	New York	73⅛	70⅝	73⅛	Jy. 15, Au.1 QX	1.25
Texas Gulf	New York	66¼	64⅜	66⅜	Ju. 1, Ju. 15 Q	1.00
MINING, SMELTING, REFINING AND GENERAL						
Amer. Metal	New York	43⅞	42½	43⅜	Au.20, Se.1 Q	0.75
Amer. Metal, pfd.	New York	110½	110½	110⅜	Au.22, Se.1 Q	1.75
Amer. Sm. & Ref.	New York	167½	160⅝	166½	Jn.8, Au. 1 Q	2.00
Amer. Sm. & Ref. pfd.	New York	127½	126	127⅜	Au. 1, Se. 1 Q	1.75
Consol. M. & S.	Montreal	....	....	226	Jn. 30, Jy. 15 X	6.25
Newmont Mining	N. Y. Curb	95	87	92½	Jn.30, Jy.15 Q	1.00
U. S. Sm. R. & M.	New York	43½	41⅞	43	Jy. 6, Jy. 15 Q	0.87½
U.S. Sm. R.&M. pfd.	New York	50¼	50⅛	50⅛	Jy. 6, Jy. 15 Q	0.87½

* Cents per share. † Bid or asked. Q, Quarterly. SA, Semi-annually. M, Monthly. F, four weeks. I, Initial. X, Includes extra. The first date given is that of the closing of the books; the second that of the payment of the dividend.

Boston quotations courtesy Boston Stock Exchange; Toronto quotations those of the Standard Stock Exchange of Toronto, by courtesy of Arthur E. Moysey & Co.; Spokane, Pohlman Investment Co.; Salt Lake, J. A. Hogle & Co.; Colorado Springs, Colo., Henry Sachs.

LONDON QUOTATIONS—WEEK ENDED AUGUST 9, 1927

Name	High	Low	Last	Date	Amount	Last Div.
Aramayo Mines (25 frs.)	81/1½	78/9	80/—	Aug., 1927	5	p.c. (†)
British Platinum (£1)	2/—	1/6	2/—	Feb., 1925	2½	p.c.
Burma Corpn. (10 rupees)	14/—	13/6	13/10½	Aug., 1927	6	annas*
Bwana M'Kubwa (5s)	5/1½	4/6	4/9—			
Camp Bird (2s)	4/3	3/—	3/3			
El Oro (£1)	3/9	3/—	3/6	Nov., 1924	2½	p.c.*
Esperanza (10s)	—/3	—/1½	—/1½			
Frontino & Bolivia (£1)	15/—	14/3	15/—	July, 1927	5	p.c.
Mexican Corpn. (£1)	9/—	7/—	8/—			
Mexico Mines of El Oro (£1)	16/3	15/—	16/3	Dec., 1926	3½	p.c.*
N'Changa Copper Mining	9/6	9/—	9/6			
Oroville Dredging (£1)	5/4	4/—	5/—	Dec., 1923	3½	p.c.
Ouro Preto (£1)	3/—	2/—	2/—	May, 1925	2½	p.c.
Rhodesian Congo Border (£1)	46/3	40/—	40/—			
St. John del Rey (£1)	10/9	10/3	10/7½	May, 1927	3½	p.c.
San Francisco Mines (10s)	28/6	27/9	28/6	July, 1927	15s.	
Santa Gertrudis (£1)	19/1½	15/—	15/3	July, 1927	7½	p.c.
Selukwe (2s. 6d.)	9/3	8/1½	8/1½	April, 1917	6¼	p.c.
S. Amer. Copper (2s.)	3/—	2/9	3/—	Nov., 1917	75	p.c.
Tanganyika (£1)	70/3	51/3	56/3	Aug., 1926	7½	p.c.
Union Miniere du Haut-Katanga (Brussels)	10.125	98.10	10.090	July, 1927	182.60	(‡)

* Free of British income tax. † Swiss francs and plus 15 p. c. bonus. ‡ Belgian frs. and free of taxation.

Modern Equipment

Consolidated M. & S. Co. Discovers Advantages of Turbo-Generator Equipment

DURING the summer of 1926 the management of the Consolidated Mining & Smelting Co. of Canada, decided upon the installation of two 1,500-kw. turbo-generator sets as stand-by power for the Sullivan concentrator and as power supply for the St. Eugene mill, at Moyie, B. C. At that time the boiler installation consisted of three Babcock & Wilcox stoker-fired boilers rated at 318 boiler horsepower each and operating at 80 lb. pressure, which supplied steam for metallurgical purposes and mill heating.

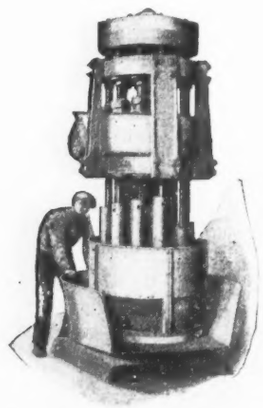
An additional boiler was installed, the pressure was raised, and superheaters were put in. The two 1,500-kw. (Westinghouse) turbo-generators that were added take steam at 190 lb. pressure and 100 deg. superheat, and deliver electrical power at 600 volts, 3 phase, 60 cycles, to the busbars in the mill substation. The cooling water from the Wheeler condensers is returned to the head of the mill at about 90 deg. F. and used to heat the pulp.

The total heat required for the mill under winter conditions with operations at 3,500 tons per day is about 42,000,000 B.t.u's per hour. In order to have this amount of heat in the condenser cooling water at 90 deg. F., the input to the turbine is 50,000 B.t.u.'s per hour and the electrical output is 2,150 kw. In other words, by the use of high-pressure superheated steam, the turbine plant can supply all heating requirements and generate 2,150 kw. per hour by burning only about 20 per cent more coal.

The installation has been highly successful in guarding against shutdown in times of power shortage from the regular source of supply and is now being increased by the addition of one more turbo-generator set and the installation of three boilers.

Latest Model of Portable Stamp Mill Embodies Many Improvements

New Design Is of Gearless Type—Extreme Simplicity Makes It Suitable for Transportation to Remote Localities



A new portable stamp mill

THE new model Straub mill embodies some striking improvements, and retains its unique features, such as portability, crushing capacity, and reliability. The latest design is of extreme simplicity, calling for the least number of moving parts, in an effort to give satisfactory service under rigorous conditions. This latest model is of the gearless type, the bevel gear and pinion, together with the pinion shaft, thrust bearings, and pedestals formerly used, being completely eliminated.

The drive is now of the simplest type, consisting of a special wood-faced cast-steel-spoke bullwheel fitted directly to the vertical camshaft. The camshaft itself has been increased in size and fitted with long bronze bushings. In the new model the lower bearing runs in an inclosed oil bath, and the cam plate and cam rest upon a special Timken roller thrust bearing, also operating submerged in lubricant. Visible indicators are supplied so that the level of the oil bath can be instantly verified. This oil bath lubricant eliminates at this vital point all possible chance of failure through lack of lubrication. The camshaft does not extend through the lower head, and therefor oil or grease cannot possibly foul the ore. An additional refinement consists of a grease pocket cast into the tappets and packed with lubricant as a precaution against over-lubrication. The entire tappet and cam assembly is inclosed with readily removable guards shown in the halftone.

The ore feed consists of the standard heavy pattern Challenge feeder, distributing the ore onto a chute, from which it falls onto the inverted cone in the center of the mill, and is there distributed equally to all of the stamps.

A great improvement made in the lower screen assembly gives instantaneous access to the interior of the mill and permits the operator to actually see the crushing operation while the mill is in operation. The chuck plates which determine the height of the discharge through the screen have been tripled in thickness, giving increased durability and satisfaction.

The boss heads, which are made of steel forgings, have been increased in length, giving additional weight at the most effective point.

These mills are made in three sizes of 5, 10, and 14 stamps, requiring only 3, 7 and 12 hp., respectively.

The screen area is extremely large, extending completely around the mill, so that rapid crushing and quick discharge are insured. Owing to the revolving motion imparted to each stamp by the cam, the wear on the shoes and dies is remarkably even, and hence they can be worn down extremely thin. This motion also exercises a distinct polishing and brightening action upon any metallic values, so that the inside amalgamation properties of the mill are very pronounced. The entire design, it is claimed, renders this mill suitable for transportation into the most remote localities, and is the basis of the slogan "Anywhere a mule can go."

This Method of Arc Control an Improvement in Welding

USERS of resistance welders of a capacity of 200 amperes or more will be interested in the Shuntweld arc control, just patented by the Ohio Brass Co., Mansfield, Ohio. This new device, which is intended for use where electrode polarity is negative, makes a good substitute for the heavy and expensive M-C type of welder.

The device is desirable in shop welding work for more reasons than one. According to the manufacturer, it reduces striking and maximum operating arc voltages; eliminates spattering steel globules, a condition which results in less electrode consumption; cuts out brittle and oxidized metal and results in better mechanical and electrical characteristics of deposited metal; results in less difficulty with electrode "freezing" to the work; and, finally, it is usable with any 250-volt, 200-ampere or larger resistance type welder.

The invention comprises a magnetic switch, automatically controlled, with small shunt resistance mounted in a small frame, forming an individual unit which when connected to the standard O-B 250-volt welder will produce the equivalent of the old shunt welder or a motor generator type welder.

Two maximum values of arc voltage or arc length, high and low, are indicated on the panel board and manipulated by a small switch. The maximum are length provided for is about $\frac{3}{8}$-in., since anything higher than that results in a very brittle, porous weld, and high electrical resistance.

American Rolling Mill Co. Acquires Two Plants

The American Rolling Mill Co. has acquired the property, plants, business and patents of the Columbia Steel Co. and the Forged Steel Wheel Co. at Butler, Pa., and Elyria, Ohio.